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ABSTRACT

This practicum was designed to address a problem in a teacher education program where case study experience for education students to learn to diagnose learning disabilities was limited and difficult to provide due to such problems as course scheduling, transportation in a rural area, and identifying appropriate children for study. Participants included undergraduate and graduate students, school district resource teachers, and faculty instructors. Practicum goals were to improve case study experiences for preservice education students learning to diagnose the nature of learning disabilities in school age children and youth; enhancing inservice teacher training; and facilitating the use of technology across the curriculum in the teacher education programs. With the available technology in the school of education, a computer simulation for case study was implemented. The vast majority of students found computer simulation case study to be an easy-to-use and effective tool in the education program. Included in the appendices are questionnaires used in the evaluation of the simulation. (Contains 43 references.) (Author/JLB)

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# Computer Simulation: Improving Case Study Methods for Preservice and Inservice Teacher Education

by

Margaret E. Brown

Cluster 40

A Practicum II Report Presented to the
Ed.D. Program in Child and Youth Studies
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

NOVA SOUTHEASTERN UNIVERSITY

May 1994

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PRACTICUM APPROVAL SHEET

This practicum took place as described.

Verifier: Norman Watts
Norman Watts, Ph.D.

Professor, School of Education, Acadia University
Title

Wolfville, Nova Scotia. B0P 1X0
Address

May 24, 1994
Date

This practicum report was submitted by Margaret Elizabeth Brown under the direction of the advisor listed below. It was submitted to the Ed.D. Program in Child and Youth Studies and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

Approved:

June 20, 1994
Date of Final Approval of Report

Mary Ellen Sapp
Mary Ellen Sapp, Ph.D., Advisor

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Without the unfailing support of my family, this practicum would not have been possible. For the many sacrifices made without complaint over my years of study, I humbly offer my thanks and love.

To Douglas, a profound and creative teacher, who was and is my inspiration to continue learning, and who in his own unique way is always there to support me when my steps falter, I offer my deepest gratitude, respect, and love.

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# ABSTRACT

Computer Simulation: Improving Case Study Methods for Preservice and Inservice Teacher Education. Brown, Margaret E., 1994: Practicum Report, Nova Southeastern University, Ed.D. Program in Child and Youth Studies. Elementary/Secondary/Special Education/Teacher Education/Inservice Training/Learning Disability/Assessment/Case Study/Computer Simulation

This practicum was designed to address a problem in a teacher education program where case study experience for education students to learn to diagnose learning disabilities was limited and difficult to provide due to such problems as course scheduling, transportation in a rural area, and identifying appropriate children for study. Participants included undergraduate and graduate students, school district resource teachers, and faculty instructors.

Practicum goals were to improve case study experiences for preservice education students learning to diagnose the nature of learning disabilities in school-age children and youth, enhancing inservice teacher training, and facilitating the use of technology across the curriculum in the teacher education programs. With the available technology in the school of education, computer simulation for case study was implemented.

The vast majority of participants found computer simulation case study to be an easy to use, effective tool in the education program alleviating many of the difficulties associated with live or paper case study. Faculty indicated willingness to incorporate the technology in their courses. Computer simulation case study in both preservice and inservice education programs was strongly supported.

* * * * * * * *

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# CHAPTER I

# INTRODUCTION

## Description of the Work Setting and Community

The work setting for the practicum was a school of education in a small rural university in a Canadian province. The school of education offered a Bachelor of Education program with a special education focus at both the elementary and secondary levels, and Master of Education degrees in General Education, Special Education, and Counselling.

The Bachelor of Special Education program was a two-year post baccalaureate program which admitted approximately 70 students each year. The Master of Education programs admitted approximately 20 full-time students each year, and at any given time had approximately 40 students progressing through their programs on a part-time basis. The programs were staffed by 15 full-time faculty members and 10 adjunct instructors. The writer was one of four full-time faculty members in the special education department.

During the implementation of the practicum, the population affected included both Bachelor and Master level students, Special Education faculty members, and Resource Teachers from the local school district, all of whom learned to use a computer simulation case study and were asked to provide feedback on the experience. The participants specifically involved were as follows: 30 of 40 B.Ed. students enrolled in Special Education and/or Computers in Education courses; 10 M.Ed. students enrolled in special education courses; three of the four Special Education faculty members; and four Resource Teachers from the local district school board.

## Writer's Work Setting and Role

The writer was a full-time faculty member in the School of Education, teaching courses in diagnosis of learning difficulties, individualizing instruction, mainstreaming, and psychology of exceptionality; a researcher in the areas of curriculum adaptation for including students with special learning needs in regular secondary classrooms, social networks for students with severe disabilities in secondary schools, and use of technology for students with severe disabilities; a member of the national research committee on mainstream daycare (SpeciaLink), chairperson of the School of Education scholarship committee; and co-ordinator of the graduate program in Education Integration offered jointly by this university and the national technical and research institute on mental handicap.

# CHAPTER II

# STUDY OF THE PROBLEM

## Problem Description

Case study experience for Bachelor of Special Education students to learn to diagnose the nature of learning disabilities in school-age children and youth was limited in scope and increasingly difficult to provide due to problems with course scheduling, transportation in a rural area, and reluctance on the part of schools to identify appropriate children for study. Special education faculty and students were increasingly frustrated with their present use of live cases for the study of learning disabilities in children and youth. Schools were reluctant to identify suitable cases, and scheduling time for the necessary components of an appropriate assessment was difficult to arrange around scheduled courses and practica. The technology was available within the school of education to create and to use computer simulations for case study, however, few simulations have yet been developed commercially, and most students and faculty were not familiar or comfortable with the technology.

In brief, technology had the potential to help solve the increasing problems associated with accessing suitable cases for education students to study learning disabilities in children and youth. To date, few cases have been developed, students were not accustomed to using the technology, and technology had not been incorporated as a meaningful learning tool throughout the Bachelor of Education curriculum. The present limited access to live cases for study and the lack of use of the technology seriously hampered the education students' learning.

## Problem Documentation

Evidence of the problem had been growing over the past several years and was supported by interviews with faculty instructors and students, course evaluations completed by students, and interviews with district school board personnel. The writer had been present at faculty meetings and had been a party to discussions on problems associated with case studies.

Within the School of Education, all four special education faculty instructors were interviewed using guiding questions (see Appendix A) to obtain information which was recorded through notetaking. Interviews using the same guiding questions were conducted with four resource teachers in the schools and with 12 students who had completed the course.

The faculty instructors reported that the time required to engage in a case study with a child in school cannot be satisfactorily accommodated while the education student was occupied with course work at the university. University courses were typically scheduled during the same hours that schools were in session. They further noted that this difficulty had been corroborated by the education students.

Students were asked to complete course evaluations upon completion of each course in the program. Course evaluations were typically in the form of a series of statements regarding the instructor, course content, texts, teaching methods, etc., which students responded to using a 5-point Likert type scale ranging from strongly agree to strongly disagree. In addition, open-ended questions invited students to comment freely on any aspect of the course. For the last two years, approximately 150 evaluations of the course that included a case study on learning disabilities were received. According to faculty instructors, these evaluations revealed that approximately 60% of the education students noted their frustration with trying to engage in a case study during their student teaching practicum in the school. Students correctly expected the teaching practicum to receive their full attention. Data from the 12 student interviews indicated that all students experienced a similar frustration.

Course evaluations revealed an additional concern resulting from the fact that the university was situated in a rural area, necessitating extensive travel to visit the district schools. Ninety percent of education students were unable to reach the schools during school hours (other than during the teaching practica), and more than 50% reported having difficulty affording the travel costs to the schools or to children's homes. Student interview data was consistent with the course evaluation data.

Another part of the problem was noted within the public schools. All faculty instructors shared the responsibility of supervising students on their practica in the schools. In doing so, they received feedback from the teachers on various aspects of the university program. When asked in the interview, faculty instructors noted that teachers in 27 of 32 schools in the district had indicated their reluctance to identify any student in a manner that could be perceived as negative, as might be the case with learning disabilities. Faculty instructors stated that it was increasingly difficult to find a sufficient number of suitable cases for education students to study. Additionally, even when sufficient cases were identified, there was a time factor involved. Twenty-five of 32 teachers had stated that they were reluctant to release a child from class for the time required for the case study, and 15 of 32 teachers had indicated that they were uncomfortable having an education student in the classroom to observe the child in that context. Interviews with the resource teachers indicated that the views expressed above by the teachers were typical of those found in their schools.

Whenever live cases were used for study, the question of confidentiality had to be satisfactorily addressed. All four special education faculty instructors expressed concern regarding the risk of breaching confidentiality whenever university students were working with public school children. It was the view of faculty instructors that all teachers shared this concern and that the schools often imposed limitations on the access the university students had to certain aspects of the case. This was corroborated by the information obtained from the resource teachers. In addition, faculty instructors reported that approximately 50% of course evaluations completed by education students had consistently questioned the value of engaging in a case study which limited access to the child, the family, the teachers, and the specialists. Eight of the 12 students interviewed raised similar concerns about the limitations placed on them when involved in a case study. All four special education instructors attending faculty meetings had repeatedly expressed their concern and frustration with their inability to provide education students with a meaningful, accessible case study experience.

A further complicating factor related to conducting case studies in the schools was securing sufficient faculty time to spend with the education students while they were in the schools. All four special education instructors and approximately 50% of course evaluations completed by education students expressed frustration because instructors were only able to monitor and support students at arm's length during the case study experience in the schools. In interviews, eight of 12 students indicated the same concern.

The final aspect of the problem related to the use of technology in general, and computer simulation in particular. Three of the four special education faculty instructors, and eight of 10 other education faculty instructors, were unfamiliar and uncomfortable with the available technology, and tended not to use it, except possibly for word processing. All faculty instructors expressed an interest in computer simulation, but were unsure of their ability to use it. Interestingly, four of the 12 students interviewed felt confident that computer simulation would pose little problem for them, whereas the remaining eight students expressed some apprehension about their ability to use it. While computer simulation has been used in a number of disciplines, few computer simulation case studies in special education presently exist, consequently, none of those interviewed had had any experience with them.

## Causative Analysis

The cause of the problem appeared to be multifaceted, related to the various components involved in using live case study for understanding the nature of learning disabilities. One cause related to the fact that in recent years school climate was changing toward full inclusion, where all children were considered to have unique strengths and learning needs, and therefore, no child was singled out based on a particular learning characteristic. The schools were reluctant to identify children suitable for case study.

Because the university was situated in a rural area, the school district was overburdened with requests from various university departments for student teaching placements, case studies, and research. Time and distance also contributed to the cause of the problem. School hours and university hours conflicted, making travel time to schools in a rural area impossible during regularly scheduled courses. Also, university students could not afford the additional cost of travel to schools.

Gaining access to children was a part of the problem, as teachers were reluctant to release children from classes for case study participation while the university students were in the schools for their teaching practica. Further, the risk of confidentiality was a serious concern for schools and the university. Therefore, full access to the child, the family, the teachers, and the specialists was often limited.

Another part of the cause of the problem was found within the university. The teaching loads of university instructors permitted only minimal supervision, monitoring, and support to students while they were engaged in the case studies.

When considering technology as a possible means of providing university students with an opportunity to investigate learning disabilities, two other parts of the problem arose. First, university instructors under-utilized the available technology, and most were unable to use technology options other than word processing. Secondly, few, if any, computer simulation case studies for diagnosing learning disabilities presently exist.

In summary, the cause of the problem seemed to be complex, having components associated with identification of and access to appropriate children, with the rural nature of the community, with the structure of the university program, and with the capabilities of the university and the faculty instructors.

## Relationship of the Problem to the Literature

The review of the literature indicated a clearly defined need for teacher education programs to prepare teachers for the complex learning needs of the students they will find in their classrooms, and to incorporate the use of technology as a meaningful tool throughout the curriculum.

### Teachers' Assessment Skills

Lipp (1991), as a distinguished lecturer at the International Conference of the Council for Exceptional Children, described the developmental agenda for special education in the 1990s. She noted that classroom teachers had indicated that, with the general movement toward integration of students with special needs into regular classrooms, they felt unprepared to handle the demands placed upon them. Further, many teachers claimed to have had no previous special education training and very little knowledge of the processes of individualizing curricula for exceptional students. The role of resource room teachers was shifting from primarily one of assessing students with special learning needs and individualizing curricula, to one of being a consultant to regular classroom teachers. However, Lipp (1991) indicated that the transition to this new role was far from complete.

The problem of teachers feeling unprepared for the demands placed upon them was not limited to classroom teachers. Billingsley and Tomchin (1992) studying four first-year special education teachers of learning disabled students, noted that problems experienced by these beginning teachers were in part related to preservice preparation. Particular concerns were expressed regarding pedagogical issues such as diagnosing student levels and determining what and how to teach, lack of preparation for the complex demands of teaching students with learning disabilities, limited concept of teaching, and lack of important knowledge and skills in effective instructional practices. These difficulties were strikingly similar to those described by Lipp (1991) regarding classroom teachers.

Lerner and Schuyler (1974) described the training of prospective specialists to make a diagnosis of a child with a suspected learning disability as a primary aim of the learning disabilities programs in colleges and universities. Students were expected to learn to plan and implement remediation within a clinical teaching program. However, this clinical practice was often limited within the training programs because of the costs involved. Lerner and Schuyler believed that clinical experiences were frequently insufficient to adequately train the learning disabilities specialists because clinic space was often limited, college supervisory personnel were in short supply, and student time that could be devoted to clinic work was insufficient.

## Technology and Teacher Education

The recent thrust toward incorporating technology into education has impacted not only on schools, but on teacher preparation programs as well. Carey (1992) reviewed the uses of computers in school between the late 1970s and the present, using five examples from her experience to illustrate how technology had been used in superficial ways, leaving students unchallenged and curriculum unchanged. She noted that while teachers in elementary and secondary schools were attempting to respond to the expectation that they use computers with their students, such expectations did not include a clear mandate for the corresponding curriculum change that would integrate, rather than append, technology. Carey (1992) believed that

> As long as the skills and procedures for technology use remain separate from curricular implementation methods, preservice and inservice teacher education will continue to produce educators who are committed to technology use that may remain cosmetic and separate from the curriculum (p. 23).

Carey further stated that this could only be avoided if these issues were addressed early and continually in the teacher education environment by having curricular applications explicitly modeled and applied in the preservice classroom.

To understand how technology was being integrated into the preservice teacher education curriculum, Carr, Novak, and Berger (1992) developed a 28-item questionnaire to survey 32 teacher preparation institutions, instructors of the Council for Preservice Technology, in Michigan. The questionnaire covered general information about the students and faculty; the number and types of microcomputers, peripherals, and related equipment available; equipment access and technical resource assistance available; yearly costs associated with technology; and needs of the institution for integrating technology into the preservice teacher curriculum. Based on a return of 15 completed questionnaires, the findings indicated that while three-quarters of the teacher educators used technology for general purposes, less than one-third used it in their instruction of preservice teachers, and less than one-half had a computer in their office. Time and access to equipment were the greatest barriers in faculty's attempts to integrate technology into their teaching.

Addressing the issue of technology specifically in post-secondary education, Carey (1992) highlighted two problems. First, preservice teacher education students typically experienced large lecture halls, resources confined to separate buildings such as libraries, computer laboratories staffed with student tutors, and classrooms augmented by the standard technologies such as overhead projectors and chalkboards. And secondly, teacher education programs continued to package technology use in a single class, separate from methods courses and other requirements of their programs.

Based on their experience teaching educational technology courses that focus on leadership issues, Kearsley and Lynch (1992) agreed with the concern expressed by Carey (1992) and by Carr, et al., (1992), that while training of teachers about technology occurred almost universally in schools of education, it was typically limited to courses which focussed only on operational skills. Kearsley and Lynch (1992) argued strongly that teachers and school administrators needed to have training in technology leadership. The nature of this leadership went beyond general leadership to include such specific technology-related knowledge as the ability to

1. Conceptualize and design technology-based solutions to educational problems.
2. Know and employ strategies that result in the successful implementation of technology-based educational solutions.
3. Explain and predict the changes that adopting a new technology will entail, including critical evaluation of the possible side effects and human impact.
4. Understand the strengths and limitations of current and emerging technologies.
5. Conduct evaluations of technology, including formative and cost/benefit studies.
6. Understand the conceptual and theoretical issues underlying the application of instructional technology (p. 58).

Despite progress made in training faculty and teachers in the use of instructional technology, this knowledge remained generally absent in teacher preparation programs. The lack of any critical examination of technology leadership and the factors associated with the exemplary use of technology, led to the generally ineffective use of technology in the educational system (Kearsley & Lynch, 1992).

Lahm (1989) prepared a symposium report based on presentations made at an Invitational Technology Symposium, Advancing the Use of Technology: The Research/Practice Connection, held in Washington in 1989. In this document, Mittler (1989) identified many barriers to the use of technology in teacher training, including the following:

1. Lack of clarity on what to teach. Should teachers be taught what they need for today's classrooms or should they be taught the emerging technologies? Should the curriculum address the expert or try to convert the non-users to users?

2. Limited supply of knowledgeable teacher educators. Higher education faculty were not adequately trained in technology and therefore could not train others, and they did not prepare prospective teachers well enough in the basics of effective instructional strategies for these skills to generalize to technology applications.

3. Lack of space in the curriculum. Other requirements were continually being added to the curriculum, and there was little incentive to find room for yet another topic.

4. Lack of modelling of technology use for instructional purposes by teacher educators. More and more higher education faculty used technology as productivity tools, but failed to use it in instruction, and consequently failed to model its use to preservice teachers (p. 10).

Mittler (1989) believed that teachers failed to recognize the congruence between technology and the primary objective of delivering instruction. In addition, Mittler noted that teachers were typically trained in content rather than problem-solving, were fearful that technology would replace the teacher-student interpersonal relationship with a student-machine relationship, and viewed technology as just another bandwagon. To change teacher behaviour, both inservice and preservice teacher training needed to change.

The rapidly increasing availability and use of computers in public schooling necessitates that prospective teachers be able to effectively use computers in their future instruction as computers become an integral part of the classroom, and as research has indicated that computer use enhanced student learning (Liu, Reed, & Phillips,1992). The kinds of training and information offered in undergraduate teacher preparation programs also needs to reflect the changing nature of the entering students. Liu, Reed, and Phillips (1992) examined patterns of computer experience and attitudes of 914 undergraduate education students over a four-year period. Findings indicated between group differences in terms of occurrence and type of prior computer experience, major subject, and gender with respect to computer anxiety over the four-year period. An increasing number of entering students had prior computer experience over the four-year period. Significant main effects on computer anxiety were found for gender - females more than males; prior computer experience - males more than females; major - special education, elementary education, English education, social studies education, and physical education more than mathematics education and science education. While the technology skills and experience found in entering education students is expected to change in the future, the present variation in ability needs to be taken into account. Liu, et al. (1992) suggested that one way to meet students' needs could be by offering modules of instruction which segment computer-related information and skills into either general information or content-specific information. Although on the surface this strategy appeared to be fragmented, it in fact taught both the necessary technology skills and infused them throughout the curriculum, which was consistent with the views of Carey (1992), Carr, Novak, and Berger, (1992), and Mittler (1992).

## Summary

In summary, the literature described two problems in teacher education programs related to a) preparing teachers with the necessary skills to successfully identify and teach children with learning difficulties, and b) making full use of technology across the curriculum. These problems were consistent with those found in the work setting for the practicum.

# CHAPTER III

# ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

## Goals and Expectations

The following goals and expected outcomes were projected for this practicum. The overall goal was to provide Bachelor of Special Education students with ready access to case study experiences for learning to diagnose the nature of learning disabilities in school-age children and youth. To achieve this, a second goal was to develop a computer simulation case study that provided the appropriate data on the child gleaned from such sources as:

a) observations in academic classes such as reading/writing and mathematics, in non-academic classes such as physical education and music, in one-to-one tutoring situations, in free time such a recess or lunch period;

b) samples of writing, mathematics, or art;

c) audio samples of reading and speaking;

d) video samples of physical education and music;

e) academic cumulative records;

f) specialists reports from resource, speech/language, health care, physiotherapy, etc.;

g) interview with the parent(s).

## Expected Outcomes

The following outcomes were expected after successful completion of the practicum.

1. After the practicum implementation, case study would be suitably incorporated into the Bachelor of Special Education and Master of Special Education programs. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies as to changes they had made, or intended to make, in the use of case studies.

2. The three special education faculty instructors would report an expected reduction in the conflict between case study experience and course schedules. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies.

3. Thirty of the 40 education students engaged in the practicum would report an expected reduction in the conflict between case study experience and the student teaching practicum. Full attention could be given to the teaching practicum as the computer simulation case study would be available at any time convenient to the education student. Achievement of the outcome would be measured by interviewing the education students following

their experience with the computer simulation.

4. All education students would have full access to case study experience. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies and by interviewing the education students following their experience with the computer simulation.

5. Thirty of 32 schools in the district would be relieved of the need to identify a child for case study. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies.

6. All teachers would be relieved of the need to release a child from class for case study activities. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies.

7. All teachers and special education faculty instructors would be relieved of the concern regarding confidentiality. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies.

8. Thirty of the 40 education students involved in the practicum would report satisfaction with the access to information concerning the child, the family, the teachers, and the specialists afforded through the case study. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies and by interviewing the education students following their experience with the computer simulation.

9. The three special education faculty instructors and 30 of the 40 education students involved in the practicum would report

that the case study provided a meaningful and accessible case study experience. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies and by interviewing the education students following their experience with the computer simulation.

10. The three special education faculty instructors and 30 of the 40 education students involved in the practicum would report satisfactory support and feedback provided to education students as they engaged in the case study experience. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies and by interviewing the education students following their experience with the computer simulation.

11. Two of the three special education faculty instructors who previously avoided using the available technology would indicate a willingness to incorporate technology into their courses. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies.

12. One middle school case on learning disabilities would be added to the few computer simulation case studies presently available to teacher educators. Achievement of the outcome would be measured by interviewing the faculty instructors responsible for the case studies as to the suitability of the computer simulation case for addition to the technology library in the School of Education.

## Measurement of Outcomes

Success of the intervention used in the practicum was evaluated in the following ways:

1. a written questionnaire (see Appendix B) and a series of interview questions (see Appendix C) was completed by faculty instructors involved in the practicum.

2. a written questionnaire (see Appendix D) and a series of interview questions (see Appendix E) was completed by students and resource teachers involved in the practicum.

All participants in the practicum were asked to individually complete the questionnaire in writing following their use of the computer simulation case study. The questionnaire addressed the suitability of the case study methodology, ease of use, comprehensiveness, accessibility to all relevant sources of information, accessibility in terms of time and distance, reduction of risk factors, and reduction of inconvenience factors associated with live case studies. The interviews were conducted orally with participants, and data were recorded through notetaking.

# CHAPTER IV

# SOLUTION STRATEGY

## Discussion and Evaluation of Solutions

The literature confirmed case study as a valuable instructional tool, suggested the use of several types of technology to facilitate student learning, and indicated the value of computer simulation as a viable method of engaging in case study.

### Case Study

Case study was the primary tool used in the case method of instruction (CMI) adopted and refined by the Harvard Business School after discovering that students entering management and administrative positions were not adequately prepared to handle complex organizational problems. Graduates' ability to apply knowledge learned through traditional lecture methods to their later professional work was limited, and instructional strategies were needed to bridge the gap between theory and practice (McWilliam, 1992). In developing training programs for early interventionists, McWilliam (1992) noted that although considerable variation existed in the uses of CMI, several key elements were common across schools and instructors, and served to differentiate CMI from other discussion methods. These included (a) an emphasis on teaching the general skills of decision-making and problem-solving, (b) the use of real-life situations, and (c) active student participation in the learning process.

From their research on teacher education in early childhood special education programs, McCollum and McCartan (1988) concluded that the effectiveness of training was "as much a function of the processes used as of the content presented" (p. 283). They believed the acquisition of three general skills must cut across all other content areas of learning, and noted that these were also the skills which were best suited to case method instruction. These skills included the following:

1. Reflection and problem-solving on the part of the student through learning to use a wide range of knowledge to generate hypotheses, to evaluate the impact of interventions based on these hypotheses, and to reflect on the outcomes.
2. Self-directed learning that included the skills necessary for effective searching, synthesis, and use of available literature.
3. Joint planning and decision-making leading to collegial and mutually supportive professional relationships (p. 283).

Grambs and Carr (1991) described case study as one of the best ways to obtain insight into student behaviour because it focussed attention on a particular student, and could provide valuable information about students who were baffling, frustrating, unresponsive, or deviant for no obvious reason. Grambs and Carr (1991) suggested that the secondary teacher needed to be a teacher-counselor rather than simply the person who dispensed knowledge, and that during preservice training and throughout a teaching career, the case study method was a useful tool for gaining a better understanding of a student experiencing difficulties. They noted that many preservice secondary teacher education programs required the making of a case study. With regard to adult education, Cranton and Weston (1989) stated that a great deal of learning took place in situations where the participant was actually involved in performing tasks. This category of instructional methods, including case study, could be labelled experiential, since learning was facilitated by experiencing or directly participating in a realistic and practical situation.

Smith (1987), in a critical review of the use of the case study method in management education, stated that case study was a primary tool used by instructors which allowed students to experience realistic accounts of situations encountered in the workplace, complete with extraneous information, missing information, and conflicting values of the people involved in the situation. Through case study, the student was taught to sort through the facts of a complex situation, to identify problems, to analyze the various factors contributing to the problems, and to use sound judgement in deciding upon a course of action to follow. Case study did not provide the student with implicit or explicit solutions to the problems presented. Rather, the cases were left unsolved, and each case situation allowed for several possible alternative solutions. Reviewing research studies on the effectiveness of the case study method in management education as measured by student change, Smith (1987) found that little or no difference in knowledge acquisition between lecture and discussion/case study methods, and that discussion and case study methods were superior to lecture methods in knowledge retention and knowledge application, particularly problem-solving abilities.

Lerner (1988) stated that case study could be used extensively to provide preservice teachers with the necessary experience and practical application of theory in the diagnosis of learning disabilities in students. As early as 1974, Lerner and Schuyler used computer simulation games to present certain concepts and principles relevant to the assessment and intervention of a particular case regarding learning disabilities. They found that involving participants in in-depth discussions of the cases was an effective way to make a point or to teach a concept.

Working in the field of communication education, Kreps and Ledermen (1985) found that case studies served as the raw material for teaching problem-solving skills and at the same time, provided students with knowledge of the types of situations they were likely to face when they entered their professional field. However, they also suggested that students might experience some difficulty in adjusting to the novelty of their role in the case study method of instruction. Because students were accustomed to taking a passive role in learning activities, they might initially resist taking major responsibility for their own learning and might be frustrated by not having facts and theories to memorize or by not obtaining concrete answers from the instructor.

## Teacher Education and Change

The changing demands placed upon the public school systems to produce graduates who are technologically literate, critical thinkers, problem-solvers, and collaborators, implies a need for change in teacher education programs to prepare teachers for, among other things, the changing nature of the classes they will teach. Lipp (1991), in describing a developmental agenda for the 90s in an address to the International Conference of the Council for Exceptional Children, noted that with the general movement toward classrooms of students with widely diverse special learning needs, preservice teachers needed to be prepared for the demands placed upon them. Special education training and knowledge of the processes of individualizing curricula for exceptional students was essential. Carey (1992) suggested that the change required in teacher education was analogous to the change in the K-12 classroom, where curriculum based on facts and skills was no longer acceptable. Carey noted that the focus must be on critical thinking, problem solving, and lifelong learning, as well as on changing curriculum, critical revision, and facilitating change in the student.

Carlson (1992), noting that some teachers can use technology when they start their careers and others cannot, suggested that with standards for the technology education component of teacher education programs coming into place, changes in teacher education curricula might occur more rapidly than has been the case to date. Kearsley and Lynch (1992) indicated that teachers needed to be able to use teaching techniques that fully exploited technology, to match technology applications to the needs of the students, and to use technology to improve personal efficiency.

Strudler (1992) went a step further and stated that teacher educators needed to act as change agents and could do so by integrating technology throughout teacher education programs and modeling its effective use. Wissick (1992) agreed, stating that teachers needed to be taught in settings that modelled appropriate, effective use of the technology. Further, multimedia could be integrated into all content areas creating opportunities for interdisciplinary units. Wissick contended that this would not happen, however, without those skills being modelled in teacher training.

Kearsley and Lynch (1992) extended the notion of modelling and teaching technology use, and suggested that without incorporating the skills underlying technology leadership into training programs for teachers and school administrators, the programs retained a serious weakness. Examining the role of leadership at the state, district, principals, teachers, and technology specialists levels, Kearsley and Lynch (1992) described the factors associated with the exemplary use of technology in schools and teacher education programs. These included the ability to conceptualize and design technology-based solutions to educational problems, and to know and employ strategies that resulted in the successful implementation of technology-based educational solutions.

## Technology and Teachers

A general reluctance on the part of teachers to use technology was observed in the literature. However, Lipp (1991) stated that teachers were beginning to use technology as a tool to augment professional competencies. When used in conjunction with increased information on the nature of handicapping conditions, and increased information about ways of learning, technology greatly enhanced the possibility of equity in education. Keirns (1992) believed that specific technology training promoted teacher use of technology. In a study of a university teacher education program, Keirns (1991) found that teachers who completed computer education coursework, including general and specialized skills in the use of computers in educational settings, reported that the coursework extended their skills and directly affected their outlook toward the use of computers in their teaching situation, both for personal management tasks and for instruction. However, Thornburg (1991), in discussing ways that computer technology could support education, suggested that "if the teacher has sufficient vision, any computer can be used in ways that support true educational discovery" (p. 29). He further stated that "the hardest step to educational reform seems to be that part that costs nothing - the vision" (p. 29).

## Technology Tools and Techniques

The rapidly increasing development and production of new technology tools provides many opportunities for teaching innovations. In a review of the literature on multimedia and instruction, Wissick (1992) noted that multimedia presentations of instructional material enhanced any subject matter, lecture, or report. Animation, still frame, full-motion video, and high quality audio could supplement lecture material to make it more realistic for the audience.

While teachers must feel comfortable with the technology, Wissick (1992) suggested that this did not mean that a teacher had to take numerous courses in computers and related technologies. Contrary to Keirns' (1992) belief about the need for training, Wissick (1992) contended that teachers with little computer background could easily learn to be users of multimedia, although authoring multimedia programs required more training and experience.

Earlier forms of computer assisted instruction (CAI) are rapidly being replaced by newer technology. MacNeil and Nelson (1991) conducted a meta-analysis of 63 studies over a ten year period that used interactive video instruction, and found that the overall effect size for interactive video was positive and slightly higher than those previously reported for computer assisted instruction. They noted that the ability of multimedia or interactive video to depict real-life situations (with applications for such instructional outcomes as practice, application of rules or principles, and problem-solving), might account for the observed differences between interactive video and computer assisted instruction. Brown, Collins, and Duguid (1989) suggested that adding videodisc to create a hypermedia program further enhanced learner motivation by introducing real-life problems that allowed the learner to experience the complex build-up of contingencies that constituted the conditions needed to practice situated actions.

CD-ROM, one of the most recent technological tools, expands the educational horizon enormously, but teachers must learn to use it appropriately to be effective. MacKenzie (1992) examined the educational potential of CD-ROM as a hypermedia environment for education, and stated that:

> The success of dynamic hypertext systems depend on the extent to which designers can demystify the database and put customizing in the hands of the end users. A dynamic hypertext system that a teacher could easily tailor for a unique classroom setting would be a powerful tool. The challenge for designers is to provide a simple interface with powerful tools that allows a teacher to design. Links and documents could be added by a teacher and offered to students for their own exploration of the subject (p. 496).

Solomon (1989) described a multimedia project using a Macintosh Plus computer, HyperCard, a videodisc player, and a program called Grapevine. Solomon argued that students could think creatively, seeing their own links among pieces of information rather than understanding issues and concepts in a predetermined order. Because of the non-linearity of hypermedia, students controlled where the line of thought went and that promoted learning. The computer provided the link between the material and comprehension. Similarly, Wolf (198[illegible]) described hypertext as a database organized like a cross-referenced encyclopedia allowing a reader to branch out from the text at random to follow any number of different lines of inquiry. Hypertext permitted the learner to tap into the expertise of many other people to help solve a problem.

McLellan (1992) described hypertext systems, such as HyperCard, as offering a flexibility in structure and style that made it potentially the most versatile technology system ever developed for individualizing instruction. She suggested that a guided tour story format provided a cornerstone for instructional design in hypertext which enhanced learner motivation, navigation, and learner control. Motivating features included the ability to review and explore the material again and again. Suggestions or challenges provided in the structured exploration increased motivation by creating something of a treasure hunt. McLellan (1992) suggested that with hypertext, learners could be led along a predetermined path through the material to be mastered or could explore freely through the hypertext database following whatever path and whatever connections between pieces of information that they wished. McLellan (1992) indicated that navigation through the material to be learned could be controlled and supported with hypertext. A notebook component facilitated the learner taking notes and provided a vehicle for instructor comments and challenges. A toolbox component allowed learners to organize information in the way they wanted, to reinterpret and integrate the information according to their own individual learning needs, and to prepare their own portfolio of work.

Aside from the access to rich sources of information, new technology tools may also have important teaching techniques embedded within them. Taylor (1980) noted that multimedia takes the form of a tutor when used as a guide to learning. However, Wissick (1992) cautioned that although multimedia provided realistic simulations, the teacher/instructor still needed to act as the mediator for instruction, guiding the learning and providing the context within which students could explore. In addition, Schloss, Cartwright, Smith and Polka (1987) suggested that when using technology, teachers needed to be conscious of and understand how different contexts, presentations, and feedback methods affected student responses.

McLellan (1992) indicated that the key characteristic of hypermedia was the freedom of choice it offered to learners. Of the many challenges and problems such systems present to educators, none was greater than devising ways to help learners manage this freedom of learning. McGrath (1992) studied the conditions under which students benefitted from the many choices available when using hypertext applications such as HyperCard, by comparing learner controlled and program controlled conditions. The findings indicated that given the learner control available in hypertext, high-ability learners gained understanding, while low-ability learners had difficulty on nearly every dimension of the task. Steinberg (1989) noted that students sometimes learned less when given control over the instructional sequence, despite greater task engagement and better attitudes. To enhance learning, Steinberg (1992) recommended (a) focussing on the learning process by including well-designed questions that helped the learner focus on and apply important information, (b) adaptive learner control, and (c) dynamic locus of control allowing learners to pursue their own problem-solving strategies, and providing tools found useful by experienced problem solvers.

Rather than having to choose between learner control and program control, Frischer (1988) suggested that if the user was viewed as an explorer, rather than a student, then at every moment, both guided tours ("stories") and free exploration ("making links") could be options provided by the program. This focussed exploration offered a powerful format for instructional hypertext programs. Similar to Frischer's "focussed exploration", Bransford, Sherwood, and Hasselbring (1988) and Hasselbring, Goin, and Wissick (1989) used an "embedded data design" in their model of anchored instruction which helped to structure and motivate the exploration and made the knowledge meaningful. As stated by Bransford, Sherwood, Hasselbring, Kinzer, and Williams, (1990), the goal of anchored instruction was

> to overcome the inert knowledge problem by allowing students to experience changes in their perception and understanding as they are introduced to new bodies of information. Students may realize that, initially, they failed to define them from a more fruitful perspective or failed to come up with strategies that were the most efficient and accurate. We want to help them experience the usefulness of information and treat it as a means to important ends (p. 123).

## Simulation

Many disciplines used simulation as an instructional method in their preservice preparation programs and in professional development activities (McWilliam, 1992). For example, Kondratowicz (1990) described computer modeling and simulation of seaport and inland terminals in intermodal freight transportation systems. Traditional simulation modeling combined data, knowledge, and control programming. Simulators treated data and control logic as distinct parts, resulting in a model which could be used in many different application scenarios without requiring user simulation knowledge to modify the program. That is, new input data was supplied in the specified format through data files.

Using a similar model, Mukherjee (1991) evaluated computer simulation as an instructional method by comparing a computer simulation model for managing the operations of a hospital pharmacy with the real life outcomes in the hospital pharmacy. Sensitivity analyses, for example the relationship between model parameter changes and outcome changes, were used to check on internal validity. Overall results indicated the model was reliable. Extrapolating to other techniques and disciplines, Mukherjee (1991) suggested that training simulators, such as the driver-training simulator, were similar to instructional simulations in that students were provided with the opportunity to practice certain skills, with results contingent upon their actions and with immediate feedback.

Cranton and Weston (1989) stated that it was the unique characteristic of the individual performing in a real or simulated setting which distinguished the experiential methods from other instructional methods. Whether used in the education and training of doctors, teachers, managers, pilots, and the like, this technique had the advantage of providing a learning experience that accurately represented the situations in which the individual would be performing after completion of the course.

Cabrales and Eddy (1992) noted that although computer simulations combined some of the characteristics of computer-assisted instruction, important differences were present with simulation techniques. Computer simulations typically offered the learner a choice of strategies, and the best strategy was not always obvious. In addition, while a given strategy might be suitable, the "correctness" or "incorrectness" of a particular decision within that strategy might not be immediately apparent. Computer-assisted instruction, on the other hand, typically provided immediate feedback regarding the correctness of any given response. Bruder (1993) suggested that simulations could record a) how students learn with feedback, b) students' thinking processes, and c) students' abilities to deal with realistic situations and problems. However, although computer simulations frequently enabled teachers to see a final product, they did not always provide a detailed record of the student's decision-making process along the way.

Cabrales and Eddy (1992) discussed the application of a decision-making and policy development simulation model for higher education administrators, noting that in any simulation, complexity was necessary to cover as many variables of the situation as possible to ensure reliability, and that the inclusion of influential behaviours was necessary to ensure validity. They stated the following:

> The intricacy of learning models used for simulations can be controlled in two ways: a) the range of learning activities can

> be limited to those activities that have a significant impact on the target outcome, and b) the interactions among the activities that are included in the model can be restricted. Compared to an information-processing model whereby learners are expected to absorb information which will eventually lead to action, simulations activities expect learners to act and to observe and analyze concrete events which result from their actions (p. 106).

Carroll (1982) suggested that although every educational activity interacted directly or indirectly with every other activity, the art of designing an effective simulation model was in isolating the critical activities and in determining the crucial links between them. With conscious control on the part of the simulation developer, the learners would be able to use the model to focus upon their actual needs. Carroll further stated that the most inexpensive, versatile, and convenient type of simulation was computer simulation.

## Computer Simulation and Teacher Education

Lerner and Schuyler (1974) involved 68 students in a learning disabilities specialists program in their attempt to use computer simulation case study as a way of bridging the gap between theoretical courses and actual clinical experience. They described the process of diagnosing and teaching as an ongoing, dynamic process requiring decisions that took into account many elements and variables, including test scores, observational data, medical reports, and case history information. In a typical teacher training program, the diagnosis and teaching process was discussed in a theory course, and the student gained actual experience while working with children in a clinical or practicum course. While students generally found such clinical experiences extremely valuable, there were two problems associated with it. First, in a practicum, students were carefully guided to prevent making errors in diagnosing and teaching because such errors might be detrimental for the child involved. Secondly, the students gained experience only with the type of case they happened to encounter in the program. (Lerner & Schuyler, 1974).

Lerner & Schuyler (1974) believed that computer simulation could provide an efficient way to supplement and enrich limited training experiences for the learning disabilities specialists. It was not intended to be a substitute for either, but it did provide additional experiences without the expense and difficulties involved in the clinic setting. In a computer simulation, a student learned through the process of making mistakes while working with the simulated "child". They described simulation as a procedure in which a model or an analog to a real life situation was created for the purpose of testing or teaching. A model was constructed that was realistic and corresponded to reality in certain relevant particulars. A simulation attempted to duplicate certain activities of a system without attaining reality itself.

To evaluate the effectiveness of computer simulation case study as an instructional method, Lerner and Schuyler (1974) used an 8-question Likert type attitude scale given to 68 students; and a forced choice 8-item effectiveness questionnaire given as pretest and posttest to 19 students. Results of the attitude scale indicated that a) 94% agreed that computer simulation was a useful technique for teacher training; b) 80% agreed that the method increased their awareness of various tests and the roles the tests play in diagnosis; and c) 69% viewed case as "real" child. Results of the effectiveness questionnaire indicated that a) computer simulation had a place in teaching prospective learning disabilities specialists about diagnostic process; b) significant positive change in attitude regarding the use of the computer for teacher training; and c) better understanding of diagnostic process. Student comments in this study included that using a computer simulation case study a) required making decisions concerning tests, information needed from other professionals, and time allotment; b) created a realistic face-to-face staffing situation; c) forced them to organize data to develop hypotheses; and d) permitted comparing their decisions with decisions made by other diagnostic teams.

Lerner and Schuyler (1974) noted the following benefits of computer simulation case study use:

1. Effective additional experience, not a substitute.
2. Technique can be adapted to any training program.
3. "Children" with extensive variety of learning disabilities can be included.
4. Can be effective for preservice and inservice.

In a more recent study involving five teachers in a Master's degree program, Trumbull (1984) used a computer simulation of six cases of children with learning/behaviour problems to examine (a) teachers' perception of the viability of the simulation as representative of classroom reality, (b) the commonality of teachers' interpretation of the simulation descriptions, and if different, how the differences related to individual teaching perspectives and pedagogical theories, and (c) teachers' reaction to the behaviourist ideology used in the simulation design. Users went through the simulation playing the role of a resource/consulting teacher new to a school. Each case began with a two or three sentence description of some difficulty, focussing on behaviours and/or test scores of a problem student. Using a branching program format, the simulation then presented four possible options for dealing with the particular problem, and the user selected an option by entering the appropriate letter on the keyboard. The choice resulted in a further description and four additional intervention options, and so on until the problem was successfully resolved as indicated by the selection of successful options. Selected options were rated according to an expert validation procedure, and scores were recorded, but not shown to the user until completion of the case.

Findings in the Trumbull (1984) study indicated that (a) teachers did not perceive the computer simulation as an adequate representation of school reality, (b) teachers interpreted the simulation cases in terms of their own ideologies and teaching perspectives, and (c) the simulation did not seem to facilitate experiential learning. The teachers considered the descriptions provided in the simulations to be incomplete or inadequate. The absence of contextual and historical detail resulted in the simulation presenting an ambiguous stimulus which each teacher interpreted according to her own theory of teaching. Trumbull (1984) noted that three factors contributed to the perceived inadequacy of the descriptions: (a) the behavioural ideology guiding the simulation design, (b) the symbol system used in the simulation, and (c) the contrast between the information presented in the simulation and the kind of knowledge upon which teachers typically relied. Trumbull (1984) acknowledged that some of the problems might be specific to this simulation, but suggested there were more general problems associated with computer simulation. Perhaps the digital/verbal symbol system, rather than an iconic/pictorial symbol system, used by the simulation was not adequate to portray the reality of school situations. Such a symbol system presumed a kind of knowledge and knowing that was different from the knowledge and knowing that teachers based their practice on, which was derived from observing pupils at work, at play, in interactions with others, and from observing changes over time, and from having some information about the pupil's family circumstances. Instructional decisions based on incomplete and/or inadequate information in this instance, led to frustration and rejection of the simulation as a meaningful or useful exercise. Use of such tools as multimedia (Wissick, 1992) and HyperText (McLellan, 1992), while not available at the time of this study, could now be used to improve at least some of the noted inadequacies of the simulation design. Nevertheless, the observed flaws in the simulation design in this study provided useful information for future educators attempting to design case study simulations for teacher education.

## Summary

The case study method of instruction appeared to be a valid approach for preservice teachers to learn to diagnose learning disabilities. Case study provided students with a realistic experience similar to that which they would encounter in their professional teaching career. While it might be difficult for students to adjust to this method of instruction, the benefits of learning the necessary problem-solving skills clearly outweighed any initial discomfort they may have experienced. When adopting the case study method of instruction, the availability of high-quality cases might pose the greatest problem for instructors.

Use of multimedia, including hypertext, appeared to be motivating and challenging, and provided for planned instruction and learner control. Computer simulation case studies seemed to enhance the experiential learning method by incorporating the benefits of multimedia and promoting a decision-making, problem-solving approach for the students. It also provided for instructor monitoring of the process used by the students as they progressed through the case study.

While computer simulation case studies are becoming more available in such fields as business, medicine, nursing, and engineering, paper case studies remain virtually the sole means of using case study in education and early intervention. Little seems to yet be developed using technology to provide a multimedia interactive approach to the case study method of instruction, particularly in the field of diagnosis of learning disabilities.

## Other Solution Possibilities

While the solutions gleaned from the literature were plausible, others that were considered included

a) abbreviation of either course time or practicum time to accommodate case study work;

b) using a lab setting in the university to bring school children in for assessment;

c) allocation of university resources for education students to travel to schools and students' homes;

d) attempting to use school children, already identified by hospital clinics as having learning problems, as cases for case study;

e) providing instruction and incentives for university instructors to use the available technology; or

f) abandoning the case study method as a viable option for instruction.

These alternatives seemed less preferable to the solutions derived from the literature.

## Description of Selected Solution

The primary goal of the practicum was to improve the case study experiences for Bachelor of Special Education students learning to diagnose learning disabilities in school-age children and youth. A secondary goal was to incorporate the use of technology across the curriculum in the Bachelor of Special Education program. To this end, an attempt was made to prepare and implement a computer simulation case study, at the middle school level, to add to the limited instructional materials presently available for teacher preservice education and inservice professional development.

The computer simulation case study (Watts, 1994) used in the practicum was of a child in middle school experiencing learning difficulties. The case included the following on-screen documents which were freely available to the education student reviewing the case: an introductory description of the child, the referral, the school cumulative records and report cards since Grade One, the present teacher's report, and the developmental assessment report from a children's clinic. Observations of the child and his work were in multimedia format, and again fully available to the education student reviewing the case. These included samples of writing and mathematics scanned into the computer, an audio sample of the child reading with the text provided on screen, and an audio-video sample of the child engaged in reading, playing a board game with a teacher, and playing basketball. An interview with the parent was provided by means of a list of topics, for example, homework, friends, behaviour at home, medication, mealtime, etc., from which the education student could select to produce the parent response on the screen. To assist the education students in developing appropriate interview skills and judgement as to which avenues might be more fruitful to pursue than others, a limitation of 22 mouse clicks that produced a parent response was placed on the interview. In this way, both the quantity and the quality of the information the education student could access was dependent upon the appropriate selection of relevant topics. Since some listed items had more than one response, education students would not be penalized for selecting a topic that produced a response indicating that no further information was available on that topic. Specialists' reports were available by selecting from a list of eight: counsellor, nurse, principal, probation officer, psychologist, reading specialist, social worker, and speech pathologist. To simulate the limited resources normally found in school boards and to provide additional opportunity for making professional judgements based on the case, education students were limited to selecting a maximum of three specialists' reports. Finally, case conclusions would be available to the education students after they had completed their own assessment and written their own report. This would allow the education students to compare their assessments with that of an experienced special educator.

During the practicum, the education students, either individually or in pairs, would be introduced to the computer simulation case study by the faculty instructor in the computer lab of the school of education. Students would then be free to explore the case study at any time convenient to them, and faculty support would be available as needed.

It was anticipated that case study experience for Bachelor and Master level education students would be improved by using computer simulation in addition, or as an alternative, to live case study. The problems associated with live case study, such as conflict between case study work and course work or teaching practicum, student access to schools in rural areas, identification of a sufficient number of cases, teachers' reluctance to have observers in the classroom or to release a child from the classroom for assessment, confidentiality, access to all relevant information concerning the child, and sufficient supervision and support from faculty, were expected to be markedly reduced.

Computer simulation case study would be available for education students to work on at their own convenience and therefore would not conflict with their regularly scheduled courses, nor with their teaching practicum in the schools. Because computer simulation case study would be available in the school of education computer lab at the university, travelling to the schools in a rural area would not be necessary for case study work. The cases for computer simulation would be prepared by faculty instructors, thereby eliminating the need for classroom or resource teachers to identify individual children for case study. Similarly, teachers would not be required to have education students observing a child in their classrooms, nor would they need to release a child from class for the case study, because education students would be learning to assess learning disabilities by means of the computer simulation case study. Faculty instructors would remove all information related to personal identification of the child when preparing the computer simulation case, so that the risk of breaching confidentiality would be eliminated. Further, faculty instructors would include in the case all pertinent information and documentation and would also incorporate typical limitations such as those that would be found in a real life situation. For example, when assessing a child for learning disability, school boards are unlikely to provide access to every type of specialist just in case some important information might be found. Instead, special education and/or resource teachers are expected to use their professional judgement to determine which specialists need to be involved in any particular case to provide a specific component of the assessment. One way to provide education students with opportunities to learn and experience making those types of professional judgements is to limit access to specialists reports in the computer simulation case study to three of a possible eight. However, despite the planned limitations, the computer simulation provided more information on the child than is often available to education students when engaged in case study work with a child in school. As the computer simulation case study was housed in the school of education computer lab, faculty instructors would be much more available to provide supervision and support for the education students than is possible when case study work is conducted in rural schools spread over a wide geographic area.

It was further anticipated that specific training in the use of computer simulation case study methodology provided to special education faculty instructors and district resource teachers, would result in increased comfort with and use of technology as an important tool to be regularly incorporated into their teaching of preservice and inservice education courses. Engaging in hands-on experience with a new instructional method is more likely to lead to implementation than is knowing or reading about it, or watching others use it. The design of the practicum included such practical experience along with interviews, discussion and support for faculty instructors and resource teachers to promote the future use of computer simulation case study in education courses and ongoing professional development activities.

## Report of Action Taken

### Preparatory Activities

A multimedia computer simulation case study for the assessment of learning disability (Watts, 1994) was prepared for introduction to participants in the practicum. Included in the case study was the following:

a) text documents: school records; clinic records; specialists' reports;

b) scanned documents: work samples of child's writing and mathematics;

c) text document and audio recording: child's reading samples;

d) audio/video recordings: child in classroom, individual instruction, and free time setting;

e) interactive text document: interview with parent(s);

f) text document: expert's report on the case for comparison with the user's findings;

g) notepad feature: to facilitate the user taking notes.

Although the initial intention was to prepare two cases, the extensive time involved in the development of new cases was greatly underestimated and proved to be prohibitive. Consequently, only one case, at the early middle school level, was used for both elementary and secondary participants.

## Implementation

During the practicum implementation, 30 Bachelor of Special Education students in the Computers in Education courses and/or the Special Education courses, 10 Master of Special Education students, three Special Education faculty instructors, and four resource teachers in the local school district experienced a case study simulation. Participation in the practicum was voluntary with 47 of the 52 asked to participate agreeing to do so. Two Bachelor students, two Master students and one faculty instructor declined due to pressures of other commitments. Of the 47 who participated, none withdrew during the practicum.

The projected timeline for the practicum scheduled two participants to engage in the initial exploration of the computer simulation case study each week, and meetings scheduled with each of the various groups for debriefing and support for future implementation scheduled for the remaining weeks. While this schedule served as a general guideline, a certain flexibility proved to be necessary. For example, when problems with the computer simulation were identified in the early stage of implementation, the participation schedule was delayed until the necessary adjustments were made. Also, Bachelor students were less available for participation while they were away from the university campus engaged in their teaching practicum in the schools. Most Master students and some Bachelor students were more available for participation during the university Spring study week. Consequently, some weeks none or only one participated, and other weeks six or eight participated. The flexibility to accommodate each individual participant's own schedule turned out to be a necessary characteristic of the practicum.

The computer simulation case study was introduced to participants either singly or in pairs. Participants were given the choice of working alone or working with a partner. On two occasions, participants chose to work in a team of three.

Each participant, or team of participants, was given an initial orientation to the computer simulation, and then left to explore it on their own. The faculty instructor periodically checked back to address any problems that might arise and coached as needed throughout the experience. It seemed important to find the balance between being available for support and trouble-shooting, and being involved to the point that participants were responding to the instructor rather than to the computer simulation. This was particularly true for the Bachelor students who typically are more comfortable knowing what the "correct" answer is that they are seeking. Since the assessment of learning disability in children is a complex problem, it is necessary for education students to experience the reality that, although much can be learned from an assessment that will inform instructional practices, often there is no simple or single "correct" answer.

No limit was placed on the time each participant required to complete the case study, nor on the sequence used to proceed through it. As anticipated, the time varied substantially from one participant to another, depending on the person's special education knowledge and computer experience. Some participants reviewed the case slowly only once, taking extensive notes as they went along. Others preferred to move quickly around the various sections to get a "feel" for the case, and then returned to examine particular sections in more detail. The computer simulation allowed for unlimited repetitions to review any previously accessed sections. Participants who took fewer notes as they progressed through the simulation were able to return to a previous section to check for the presence or absence of consistency with the newly accessed information.

The on-screen notepad could be accessed at any time during exploration of the computer simulation case study and allowed participants to write, review, and add to their notes. Most participants used the notepad feature, although some were more comfortable with their familiar paper and pencil method of note-taking. At the time of the practicum, it was not possible to print the data generated in the notepad. A printing capability would be an important feature to incorporate in the future.

During the first month of implementation, minor problems were experienced with the use of the computer simulation, and appropriate adjustments were made. For example, access to specialist's reports was limited to three, of a possible eight, to provide the user with a realistic experience of a) the budgetary limits that naturally exist in a school system, and b) making professional judgements as to the type of additional information needed based on the nature of the particular case. Initially the markers identifying the specialist reports which had been accessed cleared after three had been chosen, and the user was then able to access three more. Adjustments were made to ensure that further access was blocked after three had been chosen, although the user continued to have access to the selected three for repeated review as many times as desired.

Upon conclusion of the case study, each participant, whether working alone or as part of a team, completed a written questionnaire and engaged in a debriefing discussion with the faculty instructor. Follow-up interviews, to obtain more detailed information regarding the computer simulation case study experience and its potential for incorporation into education courses and/or professional development activities, were conducted with 19 Bachelor students, eight Master students, four resource teachers, and three Special Education faculty instructors.

Use of computer simulation case study as an instructional methodology was discussed with Special Education faculty instructors. The discussion focussed on case study as a general instructional strategy, computer simulation case study as a specific instructional strategy in particular special education courses, and computer technology as a generic tool for improving university course instruction. A planned meeting with Special Education faculty instructors to provide follow up and support for incorporating computer simulation case study into their courses was postponed until later in the year when fall term courses are being prepared.

A meeting was held with the school district Special Education Supervisor to discuss the potential of computer simulation case study as an instructional methodology for inservice teachers needing to acquire knowledge and experience in the assessment of learning disabilities. The interest expressed at that meeting led to plans for a future meeting that will provide support for including computer simulation case study in professional development activities for teachers.

# CHAPTER V

# RESULTS, DISCUSSION, AND RECOMMENDATIONS

## Results

### Introduction

The following problem was addressed in this practicum. Case study experience for Bachelor of Special Education students learning to diagnose the nature of learning disabilities in school-age children and youth was limited in scope and increasingly difficult to provide due to problems with course scheduling, transportation in a rural area, and reluctance on the part of schools to identify appropriate children for study. The problem was similar for students in the Master of Special Education program. The solution to the problem implemented in this practicum used the technology available within the School of Education to create and to use a computer simulation for case study in the Bachelor and Master of Special Education programs and to initiate the incorporation of technology use as a meaningful learning tool throughout the Bachelor and Master of Education curricula. The present limited access to live cases for study and the lack of use of the technology seriously hampered the education students' learning. Further, a potential application of this instructional model existed in the area of professional development activities for inservice teachers.

## Comparison of Expected Outcomes and Results

The following results of the practicum implementation, based on expected outcomes, were obtained.

1. It was expected that after the practicum implementation, computer simulation case study would be suitably incorporated into the Bachelor of Special Education and Master of Special Education programs. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies (Appendix C, Question 1) revealed that no changes had yet been made to the instructional model used by faculty instructors in their courses. Two of the three faculty instructors indicated an intention to include computer simulation case study in both Bachelor and Master courses the following year. One faculty instructor expressed interest in using computer simulation case study, but felt that new cases would need to be developed to appropriately address the content of his courses, and that he lacked the expertise to develop computer simulation cases himself. All four resource teachers indicated that they felt that computer simulation should be incorporated into the Assessment and Instruction: Learning Difficulties courses for preservice teachers, and that it had potential for professional development activities for practising teachers. In addition, two resource teachers felt that computer

simulation case study would be a reasonable substitute for a present course assignment, while one disagreed, and one indicated uncertainty. Two faculty instructors disagreed, and one indicated uncertainty. Of those faculty instructors and resource teachers who disagreed, all felt that computer simulation would be a valuable complement to live case study assignment, rather than a substitute for it (Table 1).

Interviews conducted with 27 education students (Appendix E, Question 1) indicated that 17 of 19 Bachelor students felt that computer simulation should be incorporated into the Assessment and Instruction: Learning Difficulties courses, while one disagreed and one responded with uncertainty. Seven of eight Master students felt that computer simulation should be incorporated into the Assessment and Instruction: Learning Difficulties course, while one responded with uncertainty. Further, 13 of 19 Bachelor students indicated that they felt the computer simulation was a reasonable substitute for live case study assignment, while three disagreed, and three responded with uncertainty. All eight Master students indicated they felt the computer simulation would be a valuable complement to the live case study assignment, rather than a substitute for it (Table 1).

2. It was expected that after the practicum implementation, the three special education faculty instructors would report an expected reduction in the conflict between case study experience and course schedules. Interviews conducted with the three faculty instructors and

Table 1

Suitability of Computer Simulation for Teacher Education Programs

| | Incorporate Technology | | | Substitute for Live Case | | |
|---|---|---|---|---|---|---|
| | Agree | Unsure | Disagree | Agree | Unsure | Disagree |
| Fac (3) | 2 | 1 | - | - | 1 | 2 |
| RT (4) | 4 | - | - | 2 | 1 | 1 |
| BEd (19) | 17 | 1 | 1 | 13 | 3 | 3 |
| MEd (8) | 7 | 1 | - | - | - | 8 |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

four resource teachers responsible for the case studies (Appendix C, Question 2) indicated that all faculty instructors felt the conflict would be virtually eliminated because students could access the computer simulation at any time outside of class time. Additionally, it was felt that using computer simulations to learn to assess learning difficulties would provide more practice, resulting in a more efficient process when the students came to engage in a case study with a live child. All four resource teachers indicated that the conflict would be reduced if students had experience with computer simulations prior to engaging in live case studies in the schools (Table 2).

3. It was expected that after the practicum implementation, 30 of the 40 education students engaged in the practicum would report an expected reduction in the conflict between case study experience and the student teaching practicum. Full attention could be given to the teaching practicum as the computer simulation case study would be available at any time convenient to the education student. Interviews conducted with 27 education students following their experience with the computer simulation (Appendix E, Question 2) indicated that of the 19 Bachelor students, 17 believed that the conflict would be virtually eliminated because they could access the computer simulation at any time outside of class time, and two responded with uncertainty. All eight Master students interviewed believed that the conflict would be reduced, but not eliminated if live case study continued to be a part of the

Table 2

Expected Reduction in Schedule Conflicts Between Case Study and Courses and/or Practica

| | Agree | Uncertain | Disagree |
|---|---|---|---|
| Fac (3) | 3 | - | - |
| RT (4) | 4 | - | - |
| BEd (19) | 17 | 2 | - |
| MEd (8) | 8 | - | - |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

program. However, they also noted that time conflict was less of a problem for them, as they typically took fewer courses than the Bachelor students took (Table 2).

4. It was expected that after the practicum implementation, all education students would have full access to case study experience. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies following their experience with the computer simulation (Appendix C, Question 3) indicated that all three faculty instructors agreed that all education students would have improved access to case study experience, but cautioned that live case study needed to remain a part of full access to case study experience. One faculty instructor felt that computer simulation was the most useful learning activity, whereas two felt that while the computer simulation was a very valuable learning activity, the live case study was the most useful. All four resource teachers indicated they felt that computer simulation would provide improved access to case study experience for education students. However, three felt that live case study needed to be retained as a part of the experience, whereas one felt that computer simulation would suffice.

When asked to use a five-point Likert-type scale to rank live, paper, and computer simulation case study as to usefulness as a learning activity (Table 3), one faculty instructor ranked computer simulation in the "most useful" category, and two in the "almost as

Table 3

Comparison of Usefulness of Three Methods of Case Study

| | Most Useful - - - | - - - | - - - | - - - | - Least Useful |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **Live Case** | | | | | |
| Fac (3) | 2 | 1 | - | - | - |
| RT (4) | 2 | 2 | - | - | - |
| BEd (19) | 15 | 3 | 1 | - | - |
| MEd (8) | 4 | 2 | 1 | 1 | - |
| **Paper** | | | | | |
| Fac (3) | - | - | - | 3 | - |
| RT (4) | - | 1 | 2 | 1 | - |
| BEd (19) | 1 | - | 12 | 4 | 2 |
| MEd (8) | 1 | 1 | 3 | 2 | 1 |
| **Simulat'n** | | | | | |
| Fac (3) | 1 | 2 | - | - | - |
| RT (4) | 3 | 1 | - | - | - |
| BEd (19) | 3 | 13 | 2 | 1 | - |
| MEd (8) | 4 | 4 | - | - | - |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

useful" (as live case study) category. Two ranked live case study as the "most useful", and one as "almost as useful" (as computer simulation). All three faculty instructors ranked paper case study in the "less useful" category. Three resource teachers ranked computer simulation in the "most useful" category, and one in the "almost as useful" (as live case study) category. Two ranked live case study as the "most useful", and two as "almost as useful" (as computer simulation). For paper case study, one ranked it as "almost as useful" (as live and computer simulation), two as "neutral", and one as "less useful". One resource teacher ranked live case and computer simulation as equally useful.

Interviews conducted with 27 education students following their experience with the computer simulation (Appendix E, Question 3) indicated that of the 19 Bachelor students and eight Master students, all agreed that using computer simulations would improve their case study experience. Further, when asked to use a five-point Likert-type scale to rank live, paper, and computer simulation case study as to usefulness as a learning activity (Table 3), three Bachelor students ranked computer simulation in the "most useful" category, 13 in the "almost as useful" (as live case study) category, two in the "neutral" category, and one in the "less useful" category. Fifteen ranked live case study as the "most useful", three as "almost as useful", and one as "neutral". For paper case study, one ranked it as the "most useful", twelve as "neutral", four as "less useful" and two as the "least useful". One student ranked live case and computer simulation as equally useful, and one ranked live case, paper case, and computer simulation as all equally useful.

Of eight Master students interviewed, four ranked computer simulation as the "most useful" learning activity, while four ranked it as "almost as useful" as live case study. Four ranked live case study as the "most useful", two as "almost as useful", one as "neutral", and one as "less useful". For paper case study, one ranked it as the "most useful", one as "almost as useful", three as "neutral", two as "less useful" and one as the "least useful". One student ranked live case and computer simulation as equally useful, and one ranked live case, paper case, and computer simulation as all equally useful (Table 3).

5. It was expected that after the practicum implementation, 30 of 32 schools in the district would be relieved of the need to identify a child for case study. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies (Appendix C, Question 4) indicated that all agreed that using computer simulation case study would reduce the need for schools to identify children for case study, although all felt that at least some experience with live case study would still be desirable and that it would continue to involve the schools, but to a lesser degree. All four resource teachers indicated they felt that if students had more case study experience with computer simulations, there would be a reduced need for live case study and would therefore place less of a burden on the schools (Table 4).

6. It was expected that after the practicum implementation, all teachers would be relieved of the need to release a child from

Table 4

Reduction in Need for Identifying Child, Release From Class, and Confidentiality Concerns

| | Reduce Need to Identify Child | | Reduce Need to Release Child | | Reduce Concerns Confidentiality | |
|---|---|---|---|---|---|---|
| | YES | NO | YES | NO | YES | NO |
| Fac (3) | 3 | - | 3 | - | 4 | - |
| RT (4) | 4 | - | 3 | 1 | - | 4 |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

class for case study activities. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies (Appendix C, Question 4) indicated that all three faculty instructors felt that using computer simulation case study would reduce the involvement of education students in live case study in the schools and would therefore reduce the need to release children from their classes. Three resource teachers indicated that they felt that if education students had more case study experience through computer simulations they would be better prepared to conduct more of the live case assessment within the classroom, which is a growing practice in the schools, and would therefore reduce the need teachers to release children from their classes. One indicated she felt that there would always be a need to take children from the classroom for assessment purposes (Table 4).

7. It was expected that after the practicum implementation, all teachers and special education faculty instructors would be relieved of the concern regarding confidentiality. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies (Appendix C, Question 5) indicated that all agreed that with computer simulation case study, the concerns regarding confidentiality would be reduced. Also with the practice provided by computer simulations, students would be better prepared to engage in all aspects of live case study, including issues related to confidentiality. All four resource teachers indicated they felt that while computer simulation would better prepare education students for live case study, confidentiality was

always a concern when working with real children (Table 4).

8. It was expected that after the practicum implementation, 30 of the 40 education students involved in the practicum would report satisfaction with the access to information concerning the child, the family, the teachers, and the specialists, afforded through the case study. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies following their experience with the computer simulation (Appendix C, Question 6) indicated that all three faculty instructors felt that the information included in the simulation represented more complete data than their students often were permitted to access. However, all felt that the information could be strengthened and indicated that they would prefer to be involved in the development of case studies to be used in their courses. All four resource teachers indicated they felt that the information included in the simulation represented more complete data than education students often were permitted to access, however, they felt the case could be strengthened. Three of the four indicated an interest in being involved in case development in the future. Results of the questionnaire (Appendix B, Question 12) revealed that two faculty instructors disagreed that the computer simulation provided all the relevant information to be able to diagnose the case, while one gave a neutral response. Three resource teachers agreed that the computer simulation provided all the relevant information to be able to diagnose the case, whereas one disagreed (Table 5).

Interviews conducted with 27 education students (Appendix E,

Table 5

Comparison Between Computer Simulation and Live Case on Access to Information and Completeness of Data

| | Access to Information | | | All Relevant Data | | |
|---|---|---|---|---|---|---|
| | More | Some | Less | Yes | Unsure | No |
| Fac (3) | 3 | - | - | 2 | 1 | - |
| RT (4) | 4 | - | - | 3 | - | 1 |
| BEd (19) | 13 | 3 | 3 | (30)24 | 1 | 5 |
| MEd (8) | 4 | - | 4 | (10) 4 | 2 | 4 |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

Question 4) indicated that 13 of 19 Bachelor students felt they had realistic and appropriate access to information about the case, while three felt they would have access to more information with a live case, and three responded with uncertainty. Of the eight Master students interviewed, four felt they had realistic and appropriate access to information about the case, while four felt they would have access to more information with a live case. Results of the questionnaire (Appendix D, Question 12) completed by education students revealed that of the 30 Bachelor students, 24 agreed that the computer simulation provided all the relevant information to be able to diagnose the case, while five disagreed, and one gave a neutral response; and of the 10 Master students, four agreed, four disagreed, and two gave a neutral response (Table 5).

9. It was expected that after the practicum implementation, the three special education faculty instructors and 30 of the 40 education students would report that the computer simulation case study provided a meaningful and accessible case study experience. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies (Appendix C) indicated that all three faculty instructors felt that computer simulation case study was a meaningful learning activity for their students (Question 7), and that it was very accessible (Question 8) since computer time was readily available to students could be arranged around other commitments such as classes. Results of the questionnaire (Appendix B) provided further confirmation of the meaningfulness of the computer simulation (Table 6). Results

Table 6

Indicators of Meaningfulness of Computer Simulation Case Study

| | | Fac (3) | RT (4) | BEd (30) | MEd (10) |
|---|---|---|---|---|---|
| CS Useful Diagnostic Technique | Agree | 3 | 4 | 27 | 9 |
| | Neutral | - | - | 2 | 1 |
| | Disagree | - | - | 1 | - |
| Increased Awareness of Test Types | Agree | 3 | 3 | 17 | 7 |
| | Neutral | - | 1 | 11 | 3 |
| | Disagree | - | - | 2 | - |
| Increased Awareness of Test Roles | Agree | 3 | 3 | 21 | 5 |
| | Neutral | - | 1 | 8 | 5 |
| | Disagree | - | - | 1 | - |
| Effective Tool in Teacher Education | Agree | 3 | 4 | 28 | 10 |
| | Neutral | - | - | 1 | - |
| | Disagree | - | - | 1 | - |
| Understand Diagnostic Process | Agree | 3 | 4 | 25 | 9 |
| | Neutral | - | - | 3 | 1 |
| | Disagree | - | - | 2 | - |

CS= Computer Simulation; Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

revealed that all three faculty instructors agreed that computer simulation was a useful techniques for learning to diagnose learning disabilities (Question 1); increased awareness of the various types of tests used in diagnosis (Question 2), and the roles played by tests in diagnosis (Question 3); was an effective tool in the teacher education program (Question 5); and provided a good understanding of the diagnostic process (Question 6). The questionnaire also provided confirmation of the accessibility of computer simulation (Table 7). All three faculty instructors agreed that computer simulation was easy to use (Question 8), required a reasonable amount of time to complete (Question 10), and that they had sufficient access to computer time (Question 11).

Interviews conducted with the four resource teachers (Appendix C) indicated that all four felt that computer simulation case study was a meaningful learning activity for education students (Question 7), and that it was very accessible (Question 8) since education students could use computers at any convenient time. Results of the questionnaire (Appendix B) provided further confirmation of the meaningfulness of the computer simulation (Table 6). Results revealed that all four resource teachers agreed that computer simulation was a useful techniques for learning to diagnose learning disabilities (Question 1); was an effective tool in the teacher education program (Question 5); and provided a good understanding of the diagnostic process (Question 6). Three resource teachers agreed that computer simulation increased awareness of the various types of tests used in diagnosis (Question 2), and the roles played by tests in diagnosis (Question 3), while one

Table 7

Indicators of Accessibility of Computer Simulation Case Study

| | | Fac (3) | RT (4) | BEd (30) | MEd (10) |
|---|---|---|---|---|---|
| Computer Simulation Easy to Use | Agree | 3 | 4 | 28 | 10 |
| | Neutral | - | - | 1 | - |
| | Disagree | - | - | 1 | - |
| Required Reasonable Time | Agree | 3 | 4 | 22 | 10 |
| | Neutral | - | - | 5 | - |
| | Disagree | - | - | 3 | - |
| Sufficient Computer Access Time | Agree | 3 | 3 | 28 | 9 |
| | Neutral | - | 1 | 1 | 1 |
| | Disagree | - | - | 1 | - |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

gave neutral responses. The questionnaire also provided confirmation of the accessibility of computer simulation (Table 7). All four resource teachers agreed that computer simulation was easy to use (Question 8), and required a reasonable amount of time to complete (Question 10). Three agreed that they had sufficient access to computer time (Question 11), while one gave a neutral response.

Interviews conducted with 27 education students (Appendix E) indicated that 18 of 19 Bachelor students felt that computer simulation case study was a meaningful learning activity (Question 5), while one felt that live and paper case studies were more meaningful. All eight Master students felt that computer simulation case study was a meaningful and worthwhile learning activity. All 27 students felt that it was very accessible (Question 6) because they could use the computer any time it was convenient for them and it would not interfere with their other responsibilities.

Results of the questionnaire (Appendix D) provided further confirmation of the meaningfulness of the computer simulation (Table 6). Results revealed that of the 30 Bachelor students, 27 agreed that computer simulation was a useful technique for learning to diagnose learning disabilities (Question 1), while one disagreed and two gave a neutral response. Of the 10 Master students, nine agreed,while one gave a neutral response. Seventeen Bachelor students agreed that computer simulation increased awareness of the various types of tests used in diagnosis (Question 2), while two disagreed, and 11 gave neutral responses. Seven Master students agreed and three gave neutral responses. Twenty-one Bachelor students agreed that computer simulation increased their awareness of the roles played by tests in diagnosis (Question 3), while one disagreed and eight gave neutral responses. Five Master students agreed and five gave neutral responses. Twenty-eight Bachelor students agreed that computer simulation was an effective tool in the teacher education program (Question 5), while one disagreed and one gave a neutral response. All ten Master students agreed. Twenty-five Bachelor students agreed that computer simulation provided a good understanding of the diagnostic process (Question 6), while two disagreed and three gave neutral responses. Nine Master students agreed, while one gave a neutral response.

The questionnaire (Appendix D) also provided confirmation of the accessibility of computer simulation (Table 7). Twenty-eight Bachelor students agreed that computer simulation was easy to use (Question 8), while one disagreed, and one gave a neutral response. All ten Master students agreed. Twenty-two Bachelor students agreed that the computer simulation required a reasonable amount of time to complete (Question 10), while three disagreed, and five gave neutral responses. All ten Master students agreed. Twenty-eight Bachelor students agreed they had sufficient access to computer time (Question 11), while one disagreed, and one gave a neutral response. Nine Master students agreed and one gave a neutral response.

10. It was expected that after the practicum implementation, the three special education faculty instructors and 30 of the 40 education students would report satisfactory support and feedback

provided to education students as they engaged in the case study experience. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies (Appendix C, Question 9) indicated that computer simulation case studies could be more easily supervised by faculty than could live case studies because a) some class time could be used for working on the simulation under supervision; b) briefing and debriefing on simulation work could be accommodated within the class structure; and c) a faculty instructor is often available for consultation either in the computer lab or at least in the education building. The four resource teachers indicated they felt that computer simulation case study could be more easily supervised than is presently possible with live case study in the schools. Results of the questionnaire (Appendix B, Question 9) revealed that all three faculty instructors and all four resource teachers agreed that they had sufficient faculty support while engaged in the computer simulation (Table 8).

Interviews conducted with 27 education students following their experience with the computer simulation (Appendix E, Question 7) indicated that 17 Bachelor students were satisfied with the initial briefing, final briefing, and ongoing availability of support provided by faculty while engaged in the computer simulation case study. One indicated unspecified dissatisfaction and one responded with uncertainty. All eight Master students indicated satisfaction. Similarly, results of the 40 questionnaires (Appendix D, Question 9) revealed that 28 Bachelor students agreed that they had sufficient faculty support while learning to use the computer simulation, while one disagreed and one gave a neutral response. All ten Master

Table 8

Participant Satisfaction With Supervision and Support During Computer Simulation Case Study

| | | Fac (3) | RT (4) | BEd (30) | MEd (10) |
|---|---|---|---|---|---|
| Sufficient Faculty Supervision | Agree | 3 | 4 | 28 | 10 |
| | Neutral | - | - | 1 | - |
| | Disagree | - | - | 1 | - |
| | | Fac (3) | RT (4) | BEd (19) | MEd (8) |
| Sufficient Faculty Support | Agree | 3 | 4 | 17 | 8 |
| | Neutral | - | - | 1 | - |
| | Disagree | - | - | 1 | - |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

students agreed (Table 8).

11. It was expected that after the practicum implementation, two of the three special education faculty instructors who previously avoided using the available technology would indicate a willingness to incorporate technology into their courses. Interviews conducted with the three faculty instructors responsible for the case studies (Appendix C, Question 10) indicated that two of the three faculty instructors were daily users of computers, mainly for word processing. One had no computer experience (Table 9). Two of the three (one computer user, one non-user) indicated they would attempt to incorporate technology into their courses in the following year by using computer simulation case study either in addition to, or in place of, an existing course assignment (Question 11). One faculty instructor indicated an interest in developing case studies appropriate for his course content. Of the four resource teachers, one indicated she used the computer a little, and three used it to some extent (Table 9). All four resource teachers indicated they felt computer technology should be incorporated not only into preservice teacher education courses, but also into professional development activities for classroom teachers and that computer simulation case study could be used for teacher inservice.

Results of the questionnaire (Appendix B) presented in Table 10, revealed that all three faculty instructors and all four resource teachers agreed they were comfortable using the computer simulation (Question 7), that computer simulation was an effective tool in the teacher education program (Question 5), and that the

## Table 9

### Participants' Computer Experience: Faculty Instructors and Resource Teachers

| | Computer Experience | | | | |
|---|---|---|---|---|---|
| | None | Little | Some | A Lot | Constant |
| Fac (3) | 1 | - | - | 2 | - |
| RT (4) | - | 1 | 3 | - | - |

Fac=Faculty Instructor; RT=Resource Teacher.

Table 10

Indicators of Satisfaction With Computer Simulation Case Study

| | | Fac (3) | RT (4) | BEd (30) | MEd (10) |
|---|---|---|---|---|---|
| Similar to Work With Real Child | Agree | 2 | 1 | 21 | 6 |
| | Neutral | - | 2 | 3 | 2 |
| | Disagree | 1 | 1 | 6 | 2 |
| Effective Tool in Teacher Ed | Agree | 3 | 4 | 28 | 10 |
| | Neutral | - | - | 1 | - |
| | Disagree | - | - | 1 | - |
| Comfortable Using Computer | Agree | 3 | 4 | 26 | 10 |
| | Neutral | - | - | 1 | - |
| | Disagree | - | - | 3 | - |
| Computer Simulation Easy to Use | Agree | 3 | 4 | 29 | 10 |
| | Neutral | - | - | - | - |
| | Disagree | - | - | 1 | - |

Fac=Faculty Instructor; RT=Resource Teacher; BEd=Bachelor student; MEd=Master student.

computer simulation was easy to use (Question 8). Two faculty instructors agreed that the computer simulation case study seemed like working with a real child (Question 4), and one disagreed; and one resource teacher agreed, one disagreed, and two gave neutral responses (Table 10).

Demographic data collected from all 40 education students combined with interviews (Appendix E, Question 8) conducted with 27 of the education students showed that in terms of computer experience, 10 Bachelor students and two Master students indicated "constant use" or "a lot", 14 Bachelor students and seven Master students indicated "some"; and 6 Bachelor students and 1 Master student indicated "a little" or "none" (Table 11). Seventeen of 19 Bachelor students interviewed indicated they felt computer simulation could be a part of case study work (Question 9) because it was like working with a live child, provided good data, was easy to use, and was fun. One indicated unspecified disagreement and two responded with uncertainty. All eight Master students interviewed indicated they felt computer simulation case study should be included in their courses.

Results of the questionnaire (Table 10) supported the majority viewpoint by revealing that 21 Bachelor students agreed that the computer simulation case study seemed like working with a real child (Question 4), six disagreed, and three gave neutral responses. Six Master students agreed, two disagreed, and two gave neutral responses. Twenty-eight Bachelor students agreed that computer simulation was an effective tool in the teacher education program (Question 5), while one disagreed and one gave a neutral response.

Table 11

Participants' Computer Experience: Bachelor and Master Students

| | BEd Elem. (15) | | BEd Sec. (15) | | MEd (10) | |
|---|---|---|---|---|---|---|
| | Female | Male | Female | Male | Female | Male |
| None | 2 | 1 | - | - | - | - |
| Little | 2 | - | - | 1 | 1 | - |
| Some | 8 | - | 4 | 2 | 6 | 1 |
| A Lot | 1 | - | 4 | 2 | 2 | - |
| Constant | 1 | - | - | 2 | - | - |

BEd Elem=Bachelor student in Elementary Education;
BEd Sec= Bachelor student in Secondary Education; MEd=Master student.

Twenty-six Bachelor students agreed they were comfortable using computer simulation (Question 7), while three disagreed and one gave a neutral response. All ten Master students agreed. Twenty-nine Bachelor students agreed that the computer simulation was easy to use (Question 8), while one disagreed. All ten Master students agreed. Twenty-eight Bachelor students indicated they felt computer simulation could be a part of case study work (Question 4), because it was like working with a live child, provided good data, was easy to use, and was fun. One indicated unspecified disagreement and two responded with uncertainty (Table 10).

12. It was expected that after the practicum implementation, one middle school case on learning disabilities would be added to the few computer simulation case studies presently available to teacher educators. Interviews conducted with the three faculty instructors and four resource teachers responsible for the case studies (Appendix C, Question 12) indicated that all three faculty instructors believed that the computer simulation case used in the practicum was suitable for addition to the technology library in the School of Education. All four resource teachers indicated similar agreement. Interviews conducted with 27 education students indicated that all 19 Bachelor and all eight Master students felt that the computer simulation case study would be a suitable addition to the technology library.

## Discussion

### Description of participants

The 47 participants in this practicum (Table 12), Bachelor students, Master students, resource teachers, and faculty instructors, were represented by females more than twice as often as males. As would be expected, the Bachelor students clustered mainly in the two lower age groups, Master students and resource teachers in the middle age groups, and faculty instructors in the middle to upper age groups. All participants were given the choice of engaging in the initial exploration of the computer simulation case study either alone or with a partner, or occasionally as a group of three. Overall, there was little difference in the choice made by the participants, with 23 working alone and 24 working with others. The exceptions included the Master students, the majority of whom worked with others, and the faculty instructors who all worked alone.

Participants were given unlimited time for the initial exploration of the computer simulation. The mean time (Table 13) ranged from 45 minutes for male and for female Bachelor students in Secondary Education working with others, to 80 minutes for resource teachers (female) working alone. Generally the Bachelor students spent less time than did the Master students. As might be expected, resource teachers and faculty instructors spent the longest time with the simulation, as presumably their extensive knowledge and experience with learning disability assessment case study raised more questions for them and provided the basis for a

Table 12

Description of Participants by Gender, Age, and Working Alone or With Others

| | | BEd (30) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Elem(15) | Sec(15) | MEd (10) | RT (4) | Fac (3) | Total(47) |
| Gender | Female | 14 | 8 | 9 | 4 | 1 | 36 |
| | Male | 1 | 7 | 1 | - | 2 | 11 |
| Age Groups | 20-25 | 9 | 10 | - | - | - | 19 |
| | 26-35 | 4 | 4 | 2 | - | - | 10 |
| | 36-45 | 1 | 1 | 6 | 3 | 1 | 12 |
| | 46-55 | 1 | - | 2 | 1 | 1 | 5 |
| | 56+ | - | - | - | - | 1 | 1 |
| Worked | Alone | 7 | 9 | 2 | 2 | 3 | 23 |
| | Others | 8 | 6 | 8 | 2 | - | 24 |

BEd Elem=Bachelor student in Elementary Education;
BEd Sec=Bachelor student in Secondary Education; MEd=Master student; RT=Resource Teacher; Fac=Faculty Instructor.

Table 13

Mean Time in Minutes for Initial Computer Simulation Exploration

|  | Work | BEd |  |  |  |  | Mean | Mean |
|---|---|---|---|---|---|---|---|---|
| Gender | Mode | Elem(15) | Sec(15) | MEd(10) | RT (4) | Fac (3) | Work | Gender |
| Female | Alone | 58.6 | 52.1 | 70.0 | 80.0 | 75.0 | Alone | Female |
|  | Others | 55.0 | 45.0 | 69.0 | 69.0 | - | 65.67 | 63.74 |
| Male | Alone | - | 54.0 | - | - | 70.0 | Others | Male |
|  | Others | 75.0 | 45.0 | 65.0 | - | - | 60.43 | 61.80 |

Overall Mean = 63.05

BEd Elem=Bachelor student in Elementary Education;
BEd Sec=Bachelor student in Secondary Education; MEd=Master student; RT=Resource Teacher; Fac=Faculty Instructor.

more thorough exploration of it. As a group, females (Mean = 63.74 mins.) spent longer than males (Mean = 61.8 mins.), and those working alone (Mean = 65.67 mins.) spent longer than those working with others (Mean = 60.43 mins.). The overall mean time was 63.05 minutes.

## Participants' Voices

Following the participants' experience with the computer simulation case study, all 47 completed a questionnaire and 34 were interviewed to determine the value of the present experience and the potential for the future. The majority of participants agreed that computer simulation should be incorporated into the Bachelor and Master education programs. One faculty instructor observed:

> With the video component, the audio reading sample, writing and math samples, it offers so much! I can see the real value of this type of simulation for preservice.

The resource teachers went further by suggesting it had potential for inservice professional development training for teachers. One stated:

> I see this medium as an excellent opportunity to get staff teachers familiar with the process of case conferencing. I would want several teachers to use it independently, then have a meeting to collaborate and share results among staff to complete the assessment and plan an appropriate program for the child.

Another presented a somewhat similar vision:

> In-service teacher teams could use this to collaborate to

> develop a "plan" for [the child] that would involve all resources/expertise. It's cheaper and less intrusive than real live case study. It would also heighten awareness of teachers of the need for adaptations, the need for change in classrooms, and in a team context, would provide great opportunities for development of creative plans to solve some of the "problems", particularly behaviourally/emotionally disordered.

Further confirmation of the suitability of computer simulation case study for inservice purposes was provided during the meeting with the school district Special Education Supervisor. The strong endorsement for using computer simulation for professional development activities for teachers was a pleasant surprise, given that the primary focus of the practicum was on improving case study experience in preservice teacher education programs.

There was less agreement on using computer simulation in place of live case study. Faculty instructors and Master students generally felt that there was a need for both. Bachelor students were strongly in favour of having computer simulation substitute for live case study in their course assignments. This may be reflective of the logistical difficulties they had previously encountered when engaged in live case study in the schools, and the fact that the computer simulation seemed easier. It may also contain an element related to the inexperience of undergraduate students, who are less likely at this point than classroom teachers (Master students) or faculty instructors to fully appreciate either the need for a comprehensive assessment of a child having a learning difficulty, or the pedagogical relevance of case study.

It appears that the vast majority of participants believed that using computer simulation for case study would greatly reduce the conflict between the time required for live case study in the school and regularly scheduled university courses and the student teaching practica. As one Faculty Instructor noted:

> It takes the pressure off. There's no need to be in the field because the video brings the field in.

Another added the following point:

> With the practice that computer simulation can provide, students will be better prepared for and more efficient at doing a live case study in the school. That should help with the time conflict problems.

It seems that time conflicts would only be eliminated if live case study were deleted from the teacher education programs, and most participants felt that it should be retained. However, a reduction in the time conflict difficulties can be anticipated as students would have more practice at case study by means of the computer simulation and would be more professionally prepared to engage in the live case study in the schools.

Most participants felt that computer simulation gave students much greater access to case study, but the majority, including most Bachelor students, also felt that the live case study was the most useful instructional method. A Bachelor student put it this way:

> I think this is a creative way to assess students and then plan instructions appropriate to the students. However, I feel we must know and experience a case study in a school setting

> where it usually is not easy to find information. This way we will know what alternatives are available to us.

It would seem that while the Bachelor students would prefer computer simulation for a course assignment, they still viewed live case study as the most useful learning experience. Interestingly, the Master students found the computer simulation and the live case study to be equally useful, and the resource teachers found the computer simulation to be the most useful. The majority of participants found paper case study to be the least useful. To quote one Bachelor student:

> I think this [computer simulation] is a great idea. It's a lot easier to use than a paper case study. I really enjoyed the reading [audio] and video portions.

All faculty instructors and resource teachers agreed that using computer simulation case study would relieve the need to identify a child and to release a child from class for live case study. One resource teacher commented:

> As it is difficult sometimes for education students to have access to a child, this would be a great alternative.

Again, this would be true only if live case study was removed from the teacher education programs. With live case study being retained, there would still be a need to identify appropriate children for the exercise. However, if education students are better prepared by having engaged in computer simulation case study, the time a child would need to be released from class for case study should be reduced.

The concerns about confidentiality were seen by all faculty instructors to be eliminated in computer simulation case study. As one stated:

> I like the anonymity of simulation. Any identifying data can be removed or altered, yet keep the essence of the case.

The resource teachers felt strongly that live case study should be retained and therefore confidentiality would always be a concern. Again, the effect of practice through computer simulation was expected to alleviate some of those concerns.

With regard to the computer simulation providing full access to all the relevant information concerning the case, most participants agreed that the computer simulation included more complete data than was often available to education students with a live case study. A Bachelor student described it this way:

> This is a very thorough and comprehensive case study. It includes more information than what we as student teachers may have access to and it is a lot less time-consuming than having to collect all this data ourselves.

Master teachers were the exception, with half agreeing and half feeling that the computer simulation provided less information than live case study. As the Master students were mainly classroom teachers, it may be that they were not fully cognizant of the barriers education students frequently face when attempting to access all the necessary information about a child to complete a live case study.

Opinion was mixed as to whether or not the computer simulation contained all the relevant information necessary to solve the case. While more than two-thirds felt that all relevant information was included, nearly one-third disagreed or were unsure. Of those Bachelor students who disagreed, most felt that a computer simulation could not compare with a live case study.

> This is good, but it is not a "real" child. There's no personal contact, which is important.

Another commented:

> It's a lot of information to try to digest through a computer screen. It needs tangible material to supplement program.

Interestingly, all faculty instructors and most of the resource teachers expressed a willingness to be involved in the development of new cases for simulation. This seemed to provide confirmation of their intent to incorporate the use of computer simulation case study into the teacher education programs and professional development activities for teachers.

The vast majority of participants found the computer simulation to be a meaningful learning activity in terms of it being a useful diagnostic technique, an effective tool in teacher education, and a way to gain an understanding of the diagnostic process. As one Bachelor student phrased it:

> I like this program! It really helps one to understand how things go together in a case study. It does join what is learned in class with the field project we did last term. I can see more clearly how a child is assessed.

Another concurred with the viewpoint that computer simulation and live case study fit well together by noting:

> It has potential to be a great primer for us to practice case

> study and decision making before commencing a live case study.

Again, reference was made to the application of computer simulation case study for inservice purposes. A resource teacher stated:

> I can see this being used as inservice for high school teachers so that they can become more familiar with how a diagnostic process occurs and what kind of information is available to them in confidential files.

Some disagreement was expressed regarding it's ability to increase awareness of the types of diagnostic tests and the roles they play in assessment. This was most strongly felt by the Bachelor and Master students. This may result from their relative inexperience with the diagnostic process in general, and diagnostic tests in particular.

In terms of the accessibility of computer simulation as a learning tool, the vast majority of participants found they had sufficient access to computer time, and it easy to use. A Master student commented:

> You get instant feedback - information on request!

And a Bachelor student appreciated the fact that:

> You have the freedom to move around in any order and to revisit information as often as you like.

While approximately one-third of the Bachelor students felt either unsure or disagreed that computer simulation required a reasonable time to complete, most other participants agreed. A resource teacher put it this way:

> You can easily do a quick review of any and all relevant

> information - no need to shuffle papers! The on-screen video, audio, and work samples are all right there!

Obviously, resource teachers are very familiar with the time it takes to complete a comprehensive assessment of a child, and it may be the inexperience of the Bachelor students that led to the minority viewpoint.

Virtually all participants expressed satisfaction with the supervision and support provided while engaged in the computer simulation. For the faculty instructors, this was a particularly important aspect of computer simulation, as they had experienced substantial frustration with being unable to provide any reasonable level of supervision and support while their students were engaged in live case study in the schools. As one faculty instructor expressed it:

> I used to use case study in my courses, but had to cut back because it was unrealistic with present resources. With simulations I could do four or six cases, therefore giving my students a much broader experience.

Overall, the participants were pleased with the computer simulation case study and expressed many positive comments particularly with regard to the multimedia nature of it. The informal discussion among students and between students and faculty during the course of the practicum seemed to have a snowball effect with interest increasing over time. Because this was a first experience using multimedia for all of the participants, it is possible that the novelty and excitement may have heavily influenced their responses. However, on closer inspection, it is clear that many thoughtful and well-grounded comments were offered. Additionally, the fact that all participants who were interviewed agreed that the particular case used in the computer simulation should be added to the technology library in the teacher education program, supports a conclusion that the practicum had a positive effect.

## Connections With The Literature

Two problems in the teacher education programs being addressed by this practicum related to a) preparing teachers with the necessary skills to successfully identify and teach children with learning difficulties, and b) making full use of technology across the curriculum. The practicum intervention, the introduction of a computer simulation case study, was intended to make improvements in both of these areas. Participants in the practicum clearly supported the need for case study, whether live or computer simulation, as a meaningful part of teacher education programs. This viewpoint is consistent with that found in the literature regarding such education disciplines as Early Childhood Special Education (McCollum & McCartan, 1988), Adult Education (Cranton & Weston, 1989), Management Education (Smith, 1987), Communication Education (Kreps & Ledermen, 1985), and Teacher Education (Grambs & Carr, 1991; Lerner, 1988). Lerner (1988) speaks specifically to the point that case study can be used extensively to provide preservice teachers with the necessary experience and practical application of theory in the diagnosis of learning disabilities in students.

While few of the participants had extensive computer experience and none had experience with multimedia, most were eager to be involved in the practicum. It is interesting to note that Faculty Instructors were the most difficult to involve because of their full schedules. However, one has to wonder if there was not at least an element of reluctance rooted in the resistance to change (Lipp, 1991) or lack of vision (Thornburg, 1991). Teacher educators need to act as change agents and can do so by integrating technology throughout teacher education programs and modeling its effective use (Strudler, 1992). Wissick (1992) suggests that the use of multimedia in all content areas creates important learning opportunities, with those skills being modeled in teacher training. The discovery in the practicum that participants with little computer experience found the multimedia simulation easy to use is consistent with Wissick's (1992) position that teachers can become effective users of multimedia technology with having to take numerous courses in computers.

Using a hypertext system (HyperCard) to build the simulation, as indicated by McLellan (1992), allowed for control of certain variables such as number of specialist reports available, and the number of questions that could be asked of the parent in the interview. Placing students in a position of having to make professional decisions about which specialist would be best suited to the case, and to choose which questions are most relevant to ask the parent, used an important technique in the form of a tutor embedded within the technology (McLellan, 1992; Taylor, 1980). The freedom of choice and the ability to review and explore the material again and again afforded by a hypertext simulation (McLellan, 1992) was acknowledged by the participants as a positive feature.

The supervision and support provided by faculty during the initial exploration of the computer simulation, while appreciated by the participants, also addressed Wissick's (1992) concern that the instructor needs to act as the mediator for instruction, and must guide the learning and provide the students with a context within which to explore.

The computer simulation case study to assess learning difficulties used in this practicum seems to be an improvement on the one used by Trumbull (1984) in that it uses a multimedia format, rather than a symbol based branching program format limited to 16 options. The simulation used in the practicum was more similar to the one used by Lerner and Schuyler (1974). In addition, the questionnaires used in the practicum contained several questions based on a similar questionnaire used in the Lerner and Schuyler (1974) study. Results of the questionnaires in the practicum were consistent with Lerner and Schuyler (1974) results.

While only one case was used in the practicum, the framework is now in place for the addition of a variety of new cases to be added. The comment by one faculty instructor, that students could have a much broader experience with several cases is consistent with the benefit of computer simulation noted by Lerner and Schuyler (1974) that "children" with an extensive variety of learning disabilities could be included in the teacher education program. Participant responses were also consistent with the Lerner and Schuyler viewpoint that computer simulation is an effective additional experience rather than a substitute, and that it is effective for both preservice and inservice education.

## Summary

The goal was to provide Education students with ready access to case study experiences for learning to diagnose the nature of learning disabilities in school-age children and youth. The practicum was successful in demonstrating a way to alleviate many of the difficulties associated with accommodating case study experience with course scheduling, transportation in a rural area, and reluctance on the part of schools to identify appropriate children for study. The technology available within the school of education to create and to use computer simulations for case study proved to be more than adequate for the task. The practicum has clearly shown that technology has the potential to help solve the increasing problems associated with accessing suitable cases for education students as well as providing an avenue for ongoing professional development activities for practising teachers. The positive responses from all participants bodes well for the incorporation of computer simulation case study as a meaningful learning tool in both the preservice and inservice teacher education programs. The case used in the practicum will be a valuable addition to the technology library of the education program. Further, as the computer programming framework is now in place and with the interest expressed by faculty instructors and resource teachers, the development of new cases can be expected to follow.

## Recommendations

1. It is recommended that computer simulation case study be used as an effective learning tool in teacher education programs.

2. It is recommended that computer simulation case study be used as an effective tool in inservice professional development activities for practising teachers.

3. It is recommended that faculty supervision and support be provided to guide students engaging in computer simulation case study.

4. It is recommended that computer simulation case study be used as an essential learning activity in preparation for live case study.

5. It is recommended that a variety of additional cases be developed to provide increased learning experiences for students.

## Dissemination

The practicum results have been shared with the faculty instructors, resource teachers, and the county Special Education Supervisor. All have indicated interest and support for initiating the use of computer simulation in their respective areas of responsibility. Preliminary practicum results were presented at the Technology and Media International Conference in St Paul, MN in February 1994. The presentation received an enthusiastic response with offers to assist with provision of cases to be developed for simulation and to serve as sites for field testing.

It is anticipated that the practicum results will be presented at the Atlantic Educators Conference in November 1994, and the Technology and Media Conference in 1995. An academic paper derived from the practicum report will be submitted to the Journal of Computing in Teacher Education. As this is a relatively new endeavour in teacher education, it has a reasonable likelihood of being of interest to that readership.

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## Appendix A

## Interview on Case Study Work in the B.Ed. Program

The following questions are intended to assist in the evaluation of the strength and weaknesses of the way in which education students learn to assess and develop suitable programs for children with learning disabilities. Any information you can provide will be helpful to this process and will be kept in confidence. All information will be combined and reported without identification of the individual contributors.

### Guiding Questions:

1. How is case study work accommodated along with students' other responsibilities, particularly course work and practica?

2. From the course evaluation that students complete on your course(s), what has been the students' response regarding the case study component of their program?

3. What problems are there associated with students getting to the schools to pursue their case study work? (school hours, travel time, cost, etc.?)

4. What has been the response of classroom teachers to the case study work that the students engage in? (identification of cases, observation in classroom, pull-out time, etc.?)

5. What are the issues surrounding confidentiality with respect to case studies?

6. How do students access all the information they require when conducting a case study? (documents, records, child, family, etc.?)

7. How are students supervised by faculty while conducting a case study?

8. What is your present level of competence in using computer technology?

9. How could computer simulation be a part of case study work?

**Thank you.**

Appendix B

## Questionnaire on Computer Simulation Case Study
## (For Course Instructors)

**PLEASE CIRCLE THE NUMBER WHICH BEST INDICATES YOUR LEVEL OF AGREEMENT/DISAGREEMENT WITH EACH STATEMENT.**

**1=strongly agree 2=agree 3=neutral**
**4=disagree 5=strongly disagree**

1. Computer simulation is a useful technique for learning to diagnose learning disabilities............................1 2 3 4 5

2. Computer simulation increases awareness of various types of tests used in diagnosis...............................1 2 3 4 5

3. Computer simulation increases awareness of the roles tests play in diagnosis...............................................1 2 3 4 5

4. The computer simulation case study seemed like working with a real child..........................................................1 2 3 4 5

5. Computer simulation is an effective tool in the teacher education program.........................................................1 2 3 4 5

6. Computer simulation provides a good understanding of the diagnostic process...........................................................1 2 3 4 5

7. I am comfortable using computer simulation................1 2 3 4 5

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8. Computer simulation is easy to use.................................1 2 3 4 5

9. I had sufficient faculty support while learning to use the computer simulation.............................................1 2 3 4 5

10. The computer simulation required a reasonable amount of time to complete........................................................1 2 3 4 5

11. I had sufficient access to computer time ...................1 2 3 4 5

12. The computer simulation provided all the relevant information to be able to diagnose the case........................1 2 3 4 5

**THANK YOU**

Appendix C

## Interview on Computer Simulation Case Study (For Course Instructors)

The following questions are intended to assist in the evaluation of the strength and weaknesses of computer simulation as an instructional method for education students to learn to assess and develop suitable programs for children with learning disabilities. Any information you can provide will be helpful to this process and will be kept in confidence. All information will be combined and reported without identification of the individual contributors.

### Guiding Questions:

1. How do you see computer simulation case study accommodated within the course on Assessment and Instruction: Learning Disabilities, in the Bachelor of Education program? Have you, or do you intend to, incorporate computer simulation as a part of your course?

2. How does computer simulation case study affect the conflict between case study experience and students' other responsibilities, particularly course work and practica?

3. How does the use of computer simulation case study affect the time during which students have access to the case? (Compared to school-based live child? Public school hours, travel time, cost, etc.?)

4. What effect does the use of computer simulation case study have on classroom teachers? (identification of cases, observation in classroom, pull-out time, etc.?)

5. What are the issues surrounding confidentiality with respect to computer simulation case studies?

6. Do students have realistic and appropriate access to all the information they require when conducting a computer simulation case study? (documents, records, child, family, etc.?)

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7. How meaningful do you find the computer simulation case study experience?

8. How accessible do you find the computer simulation case study experience? (Available computer time, complexity of program, etc.?)

9. How are students supervised by faculty while conducting a computer simulation case study?

10. What is your present level of competence in using computer technology?

11. How can computer simulation be a part of case study work in your course?

12. Would the computer simulation case study be a suitable additions to the technology library?

13. Other comments?

**Thank you.**

Appendix D

## Questionnaire on Computer Simulation Case Study (For Students)

**PLEASE CIRCLE THE NUMBER WHICH BEST INDICATES YOUR LEVEL OF AGREEMENT/DISAGREEMENT WITH EACH STATEMENT.**

**1=strongly agree 2=agree 3=neutral**
**4=disagree 5=strongly disagree**

1. Computer simulation is a useful technique for learning to diagnose learning disabilities............................1 2 3 4 5

2. Computer simulation increased my awareness of various types of tests used in diagnosis...............................1 2 3 4 5

3. Computer simulation increased my awareness of the roles tests play in diagnosis..............................................1 2 3 4 5

4. The computer simulation case study seemed like working with a real child...........................................................1 2 3 4 5

5. Computer simulation is an effective tool in the teacher education program.........................................................1 2 3 4 5

6. I have a good understanding of the diagnostic process.........................................................................................1 2 3 4 5

7. I am comfortable using computer simulation................1 2 3 4 5

**TURN PAGE OVER PLEASE**

8. Computer simulation is easy to use....................................1 2 3 4 5

9. I had sufficient faculty support while learning to use the computer simulation..................................................1 2 3 4 5

10. The computer simulation required a reasonable amount of time to complete..........................................................1 2 3 4 5

11. I had sufficient access to the computer time ...........1 2 3 4 5

12. The computer simulation provided all the relevant information to be able to diagnose the case.........................1 2 3 4 5

**THANK YOU**

Appendix E

## Interview on Computer Simulation Case Study (For Students)

The following questions are intended to assist in the evaluation of the strength and weaknesses of computer simulation as an instructional method for education students to learn to assess and develop suitable programs for children with learning disabilities. Any information you can provide will be helpful to this process and will be kept in confidence. All information will be combined and reported without identification of the individual contributors.

### Guiding Questions:

1. How do you see computer simulation case study accommodated within the course on Assessment and Instruction: Learning Disabilities, in the Bachelor of Education program?

2. How does computer simulation case study affect the conflict between case study experience and students' other responsibilities, particularly course work and practica?

3. How does the use of computer simulation case study affect the time during which students have access to the case? (Compared to school-based live child? Public school hours, travel time, cost, etc.?)

4. Do students have realistic and appropriate access to all the information they require when conducting a computer simulation case study? (documents, records, child, family, etc.?)

5. How meaningful do you find the computer simulation case study experience?

6. How accessible do you find the computer simulation case study experience? (Available computer time, complexity of program, etc.?)

7. How are students supervised by faculty while conducting a computer simulation case study?

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8. What is your present level of competence in using computer technology?

9. Should computer simulation be a part of case study work in the course?

10. Would the computer simulation case study be a suitable additions to the technology library?

11. Other comments?

**Thank you.**